JOURNAL

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FRANKLIN INSTITUTE

OF THE

State of Pennsylvania,

DEVOTED TO THE

MECHANIC ARTS, MANUFACTURES, GENERAL SCIENCE,

AND THE RECORDING OF

AMERICAN AND OTHER PATENTED INVENTIONS.

FEBRUARY, 1833.

Remarks on the improvements on Barker's Mill by James Whiteland, with a suggestion for increasing the efficacy of the original form of the Mill.

TO THE COMMITTEE ON PUBLICATIONS.

Montville, New London county, Con., Dec. 1, 1832.

Gentlemen,—In the second number of the tenth volume of the Journal of the Franklin Institute, there is a communication entitled "Suggested Improvements in the Construction of Barker's Mill, by James Whiteland," upon which I beg leave to offer a few remarks.

The principal improvement there proposed, consists in giving the arms which deliver the water, a curved form, the curve being such that the water will run from the centre to the extremity of the arms in a straight line, when the machine is at work.

By this arrangement, says the author, no centrifugal force is communicated to the water, as it has not received any rotary motion from the arms, which would have been given had the arms been straight.

Mr. Whiteland, after describing his modification of Barker's mill, goes on to make several deductions in relation to power, and to the advantages which this form possesses; these conclusions I shall endeavour to show are erroneous, as well in a theoretical, as in a practical point of view.

In the first place, suppose the orifices in the extremity of the arms, or jet holes, to be of the same area as the passage through the arms in all their parts, in order that the water shall pass with a uniform ve-

locity in its whole course through the arms as proposed by Mr. Whiteland, then the principle of action, as well as the form of Barker's mill, is altered; for in that mill the motion is generated at the orifices or jet holes, where the water leaves the arms, and is communicated to the mill by a proper reaction; whereas, in the proposed form, the motion is generated from the centre, as the water enters the arms, and in a direct line from the centre; the mill being put in motion only by the action of the water in endeavouring to pursue a straight course, in the direction first impressed, through the arms which are curved. Now the force which the water thus exerts to put the mill in motion is much less than in the original form of the mill; for the whole force of the column is at first spent in projecting the water into the arms producing a reaction from the arms towards the centre, which has no power to put the mill in motion; and next, the impressed force remaining in the water, it moves through the arms, and in consequence of their curved form, its action, in passing through them, puts the mill in motion, the action of the water being so oblique that a small portion only of the power is communicated to the mill. It is evident that the mill moves only with a power proportional to the square of the difference between the velocity due to the height of the water in the mill, and the velocity with which it actually passes through the arms, minus, the friction in passing through them; for as action and reaction are equal, every action of the water on the curve of the arms produces a corresponding reaction or retardation of the water.

The author is, I think, mistaken in supposing that the water will pass from the centre to the extremity of the arms in a direct line when the mill is loaded, let the arms have what form they may; it can scarcely approach to such a motion when the mill is without a load, for the water in leaving the upright trunk is forced in a rectilinear direction into the arms, and if the motion of the mill is such that the water pursues the direction in which it is first projected, its exertion to propel the mill, or to continue its motion, will be nothing.

Mr. W. says that the weight which would stop the mill must be equal to the weight of a column of water twice the height of the water in the mill, and having a base equal to the sum of the areas of the jet holes. But I shall proceed to show that the weight required to stop it, minus the friction of the water in passing through, and also the friction of the mill, would be to a column of water half the height of the water in the mill, on the base before stated, as the portion of the circumference *b f*, (see figure p. 74, vol. x.) is to half the circumference, or a semicircle, until the portion *b f* is equal to a semicircle, beyond which this proportion will not hold. For any nonelastic substance, such as water, communicates only half its motion by percussion or contact; and water passing in a curve by any force does not wholly lose or impart its force until its direction is reversed, which is the case when it has passed through a curve equal to a semicircle.

If the area of the jet holes is smaller than a section of the arms, the circumstances will be measureably altered. Suppose them to be

equal to half the area of the openings through the arms, then the water passes through the arms with half the velocity that it issues through the jet holes; here reaction takes place, as the water issues from the jet holes with an increased velocity, but only in proportion to the whole power, as the square, of the difference of the velocity in the holes and arms, is to the square of the velocity due to the height of the water in the mill.

I have thought fit to make the foregoing observations and statements, without entering into a detailed explanation of my views, wishing to be as brief as possible, and presuming that those acquainted with the subject will readily understand and acknowledge my position, and that Mr. Whiteland, by reviewing the subject, may be led to acknowledge that his conclusions were incorrect, if what I have stated is true.

I now suggest what in my view would be an improvement in the application of Barker's mill. It is known that a considerable part of the power remains in the water after it has left the mill, especially when loaded; as the velocity of the mill is necessarily much less than that of the water through the jet holes. This plan I actually put in operation a few months since on a small scale: I placed a common tub wheel immediately under the mill, on the same shaft with it, so that the water as it left the mill would strike the wheel which moved in one direction, while the mill, which was made to revolve on the shaft, moved the other way; thus I used the same water twice, by reaction and by direct action. Instead of using one upright trunk, around the shaft, I used two, placed a little distance from the shaft, and opposite to each other, which were fastened or connected together, and had a water course on the top. Above this course was a drum which was made to move on the shaft by bearings, without moving the shaft with it. The tub wheel was connected with the shaft, and moved along with it, and a drum on the same shaft immediately above this, connected with the mill. By this arrangement, one part of the wheel, with its drum, would move one way, and the other part with the drum with which it was connected, moved the other way, and by belting from these two drums to a horizontal drum, and crossing the belt in a particular manner, the horizontal shaft and drum would be moved in a single direction from the combined force of these two opposite motions. As the motion of this wheel decreases by increasing its burden, its power is increased by a stronger reaction on the mill, and by a stronger action on the wheel.

Yours, with respect,

NATHAN SCHOLFIELD.

Report of a Committee of the American Philosophical Society, of Philadelphia, on certain Maritime Observations, made and submitted to the Society by Capt. CHARLES DIXEY.

TO THE COMMITTEE ON PUBLICATIONS OF THE FRANKLIN INSTITUTE.

GENTLEMEN,—The following extract of a letter of Capt. Charles Dixey, of Philadelphia, and the report in relation to it, are handed for publication, by permission of the Society to whom the letter and report were addressed.

Very respectfully yours,
A. D. BACHE.

Extract of a letter from Capt. CHARLES DIXEY *to* ROBERTS VAUX, *Esq., dated*

Philadelphia, May 15th, 1832.

"On my late passage from Liverpool, on the 25th of April, in lat. 44° N. long. 43° W. I passed near a very large island of ice; the temperature of the air at the time was 56°, of the water 58°. After this, for several days, the temperature of the air and the water declined until both fell to the freezing point. Winds variable from SW. to WNW. with very thick weather, so much so that we were not able to see beyond the length of the ship ahead, and determined to lie by, considering it the height of imprudence to run. The moderate temperature of the air and water at the time of seeing the ice, and the fact that no ice was to be seen when both water and air had fallen in temperature to 32°, are noticed from a knowledge that many navigators rely on the thermometer to indicate their approach to ice, to the exclusion of all other circumstances; and with a view to caution them against trusting to that instrument when sailing eastward from the Grand Bank in thick weather, during the season of ice-bergs."

Report on the foregoing observations.

The Committee to whom was referred a letter from Capt. Charles Dixey, to Roberts Vaux, Esq. read before the American Philosophical Society, on the 17th of August, 1832, submit the following report.

The subject on which the observations of Capt. Dixey were made, is one which has, at different times, occupied much of the attention of this society. The first remarks in relation to it are contained in Dr. Franklin's paper of "Maritime Observations," published in the second volume of the society's transactions. Dr. Franklin established by observations made in three passages across the Atlantic, included between lat. 33° 17′ N. and lat. 49° 15′ N. that the water of the Gulf Stream, is always warmer than the sea on each side of it, and recommended to navigators the use of the thermometer to indicate this, and other currents, from warmer to colder seas.

In the third volume of the Transactions of this Society are the observations of Mr. Jonathan Williams, (afterwards Col. Williams of

the Engineers,) made in 1789 and 90, on the temperature of the air and water in different parts of the Atlantic ocean, between the latitudes of 36° 30′ and 50° 24′ N. The conclusion which Mr. Williams draws from his observations, and which they most fully warrant, is that the effect of shoals is to lower the temperature of the water over them. Thus in passing over the Banks of Newfoundland in the month of July, the thermometer which had given 64°, 63° and 62° Fah. for the temperature of the ocean, fell to 47° Fah. Mr. Williams points out the difference in the effects produced by large and small banks, in depressing the temperature of the water over them, and also the effect of their situation, &c. He confirms the observations of Franklin, and urges upon the navigators of the Atlantic the use of the thermometer for the double purpose of detecting the presence of the Gulf Stream, and their approach to soundings. In passing, he remarks that the same instrument may serve to indicate nearness to masses of ice.

This subject was resumed by Wm. Strickland, (now Sir William Strickland,) of York, England, who presented to the society in 1798 (Trans. Am. Philos. Soc. vol. v.) the results of very minute observations made during a passage from Hull to New York, in July and August, 1794, and from Philadelphia to Falmouth, England, in the same months of the following year He confirms the results of Mr. Williams, and adds a new fact, namely, that a branch of the Gulf Stream extends as far as lat 47° N. long. 39° W.: this branch appears to have been crossed by him, both in his voyage to this country and on his return to England.

In the American edition of the Domestic Encyclopedia, the editor gives (article Thermometer,) an account of an observed depression of the temperature of sea water, when within five or six miles of several islands of ice: the observation was communicated to him by Mr. Joseph Donath, of Philadelphia.

Frequent observations of Capt. Parry, are in accordance with the one just referred to. It is not, however, to be expected that under all circumstances, the thermometer will indicate the neighbourhood of a mass of ice by a sudden fall. If, even, the influence of the mass were sufficient to extend to a distance, the effect might be neutralized by the presence of a warm current, and the current, though actually cooled, might not appear so in relation to the water near it. The observation of Captain Dixey is of consequence, as showing that in particular situations such may be, and is, the case, and that an attentive study of the observations already made is necessary, in order that the thermometer may be used to the greatest advantage: his remark on the impropriety of relying upon the indications of the thermometer, without considering all the circumstances of the case, will come with weight, supported as it is by the results of his experiment.

As far as the observations of Capt. Dixey have been reported, they confirm those of Messrs. Williams and Strickland. In the month of July Mr. Williams found the temperature of the ocean, in nearly the same lat. and long. referred to by Capt. Dixey, 63° Fah. The temperature of the water diminished to 47° in passing the Great Bank.

In April, when the effect of the winter's cold was beginning to diminish, Capt. Dixey found the temperature of the water 58° in long. 43° W. lat. 44° N. To the westward of this, a diminution of temperature was shown by Mr. Williams' observations, and occurred in Capt. Dixey's.

From a rise of the temperature of the water between the longitudes of 36° and 45½° W. and latitudes 47½° and 45½° N. Mr. Strickland inferred that he was crossing a branch of the Gulf Stream, and the probability was strengthened, on his return voyage, by an observation of the same rise from about long. 43° to 34½° W., and lat. 44° to 46° N. Capt. Dixey ought therefore to have noticed a rise of temperature in lat. 44° N. long. 43° W. supposing the circumstances noticed by Mr. Strickland to prevail throughout the year; and that he did not find this to be the case seems to show, that the ice had produced an effect on the temperature of the current, in this part of the ocean.

The committee present an extract from the letter of Capt Dixey, which they would recommend to the society to have published. By the example of one so experienced in his profession, navigators may be induced to examine what has already been contributed by observers, and to extend the observations so that in the various latitudes and longitudes traversed by the vessels between the United States and Europe, the temperature may be perfectly known, and the effects of a proximity to the different coasts, and to particular banks accurately determined, for all seasons of the year. Observations made in other parts of the ocean would serve to show what differences exist in the effect of banks, &c, and might, by leading to a correct understanding of the causes of the phenomena, prove of service by enabling us actually to anticipate observation.

(Signed,)

CHARLES PICKERING,
JAS. MEASE,
A. D. BACHE.

Report on the question, "Are there any trades so injurious to health, or so hazardous to morals, that they ought, for that reason, to be discouraged, or abandoned?" By the Editor.

A Lyceum upon the same general plan with those established in various parts of the country, and particularly to the eastward, has been in operation in the city of Washington for about a year past. When questions are accepted for discussion, it is the practice of the Lyceum to refer them to some member for his report thereon. This may account for the desultory manner in which the subject is treated, as such reports are not intended to be elaborate productions, but

are merely designed to pave the way to a free and full discussion; an end which they have been found well calculated to promote.

To the Washington city Lyceum, the following Report on the question, "Are there any trades so injurious to health, or so hazardous to morals, that they ought, for that reason, to be discouraged, or abandoned?" is respectfully submitted.

When a question of the above description is propounded to an individual whose mind has not been schooled by habits of reflection, and there is presented to his notice some occupation, or trade, which is obviously injurious to health, or hazardous to morals, he will probably pronounce, at once, that it ought to be abolished by the interposition of the law. The philosopher and the moralist, however, who are in the habit not only of inquiring into the immediate relationships of every subject, but of tracing each to its remote affinities, will in most cases see cause to reverse this judgment. The question before us, will, I apprehend, be found, in most of its bearings, to be one of a very complex character. This must be apparent, when it is recollected that the perfection of those arts from which civilized man derives so many of his highest intellectual and corporeal enjoyments, are dependent upon pursuits which form very remote links in the chain of events upon which civilization itself is dependent; events, however, so intimately catinated, that we may with much reason apply to them the idea of the poet, that if the connexion is destroyed,

> "Whichever link you strike,
> Tenth, or ten-thousandth, breaks the chain alike."

The question, as propounded, is so latitudinarian in its terms, as to render it impossible, in the compass of such a report as ought to be delivered to the Lyceum, to present it in many of its bearings. I shall, consequently, be compelled to assign to it limits of my own choosing; although in so doing, I may be charged with acting something like the Grecian who, having a house for sale, exhibited a single brick as a sample of its elegance and convenience.

The proportion of those trades and occupations which are unfavourable to health, or hazardous to morals, is very large, when compared with the whole catalogue of those pursued by man. Some of these are intrinsically hurtful in both respects, whilst others are rendered so, principally, or entirely, by the manner in which they are carried on, and the habits of those engaged in them. It seems necessary, however, to confine our inquiry to such as are intrinsically hurtful, as in the others, it is the habits which are to be condemned, and all will admit that these, when bad, ought to be discouraged, and abandoned.

I have already remarked that the terms of the question are somewhat vague. I allude particularly to the words "discouraged or abandoned." If regulation, or suppression, is intended, this will re-

fer the action to the legislative and executive authorities, and in this way I consider it as necessary to treat it; for if such things are to be attempted by individual exertions, the whole business of the world must merge in the formation of a thousand different societies, analogous in their organization and objects with that of the Temperance Society.

The business of the miner is, in numerous instances, extremely unfavourable to health, and that necessarily so; in proof of this position we will take an example from the mines of a common metal, lead, in a place chosen at random, where there is nothing to render the business particularly hurtful. In a work written within a year or two, it is observed by its author, Mr. Thackrah, that at the small village of Arkendale, situated in a mining district in Yorkshire, England, there were then not fewer than thirty widows under thirty years of age, whose husbands had died of diseases of the lungs, and other affections, brought on by the dampness of the mines, and the other hurtful circumstances attendant on the business in which they were engaged. Where there is so much early destruction of life, we must necessarily conclude that a large proportion of those whose constitutions enable them to resist the fatal effects of their business for a longer period, must drag out existence in a state of extreme suffering. The picture of the suffering in these mines, however, would lose its colouring along side those which might be drawn of that endured in the mines of quicksilver in Idria, of arsenic and cobalt in Germany, and of many, very many others in different countries. Were I to describe them, I must place before you such scenes of human suffering as it would be extremely painful to narrate and to hear; I forbear therefore to bring them forward, not deeming them necessary to the sustaining of the position which it is my design to advocate.

Shall we pass laws for the purpose of preserving the health, and of saving the lives of those now employed in these mines? If so, we must ordain that they shall be closed up, and that the metals which they produce shall be no more used in the arts. Let us suppose that quicksilver, one among the worst, was selected, and that the use of that metal alone was inhibited. What would then become of those mines of gold from which the precious metal cannot be obtained in any other way than by its amalgamation with mercury? All the arts which are dependent on the use of this metal, must be relinquished, and of these there are several of no small importance, and the relinquishment of which would involve very serious considerations. It may be doubted whether the ladies themselves, humane as they are, would even consent to forego the employment of those ornamental and useful mirrors by which their charms are so often and so faithfully reflected. Admitting, however, that this sacrifice was made, and for the looking glass we had substituted plates of polished metal, or in default of these, the mirror of Narcissus, there would still remain unfulfilled the most important purpose to which quicksilver is now applied. Because thousands perish in the working of these mines, shall we, to

save these, indirectly slay our tens of thousands, by depriving the physician of the use of that Sampson of medicine, mercury? A remedy, without which, his efforts to cure some of the most formidable diseases, would be altogether unavailing. Were I to pursue this part of our subject to its limits, I believe that, standing alone, it would suffice to convince any one of the utter futility of the attempt to legislate respecting, or in any other way to regulate, the pursuit of such a business as even that of digging for quicksilver.

Leaving one of the worst, we will inquire for a few minutes into some of the consequences resulting from our obtaining from the earth those substances which are among the most harmless, and the most useful productions of the mineral kingdom. Were we to visit the coal districts of England, we should find them abounding with widows and orphans, whose husbands and fathers have been blown to atoms, or scorched to death, by the explosions of the fire damps, a hundred at a time; or who have been killed by the choak damp, or drowned in the waters which sometimes make an irruption into these mines. We should, also, every where, meet the lame, and the halt, and the blind, who have merely escaped from a sudden death to drag out a miserable existence in pain, poverty, and want of every description. Shall we apply a remedy to these evils, and provide that, in the coal mines, there shall be no more accidents from carburetted hydrogen, carbonic acid, water, the falling in of roofs, or the giving way of ropes, chains, and ladders? But how shall we accomplish this? Why certainly in one way only; we must resolve to do without the coals; we must close the smelting furnaces of a nation; arrest every branch of manufacture, and at length put a final end to human misery, by allowing, in the first winter, the poor and the rich to freeze to death in one common mass, from the want of the only fuel which the country can supply.

The universal suffrage, I apprehend, would be against such a measure; at all events, when the toes and the fingers of those whose sublimated, sentimental humanity had caused them to hesitate, were becoming frost-bitten, they would send in their adhesion, and admit that it would be best to let the colliers pursue their labours, and run their inevitable risks.

Leaving the miners, therefore, to those diseases and accidents to which their occupations necessarily subject them, because, for the purpose of continuing the blessings of civilization itself, we must obtain the metallic treasures of the earth, and the coal which is necessary to smelt them, let us make some inquiry into the effects of certain manufactures of the metals, after they have been brought into their reguline state; in doing this, that one shall be chosen which does not possess any poisonous property, but which, in nearly all its combinations, is calculated to give tone to the animal system, whilst it, at the same time, forms the basis upon which the whole superstructure of the fine and useful arts is directly, or indirectly, sustained. This metal, you are all aware, is iron.

Without offering any great act of violence to the subject, we might, in speaking of this metal, introduce an inquiry into the remote effects

of certain arts and trades; not upon the individuals who are the manufacturers of particular instruments, but upon those for, or against, whom, such are to be employed. The making of great, and of small guns, of pistols, of swords, in all their numerous varieties, of pikes, dirks, &c. &c. has, it is true, no remarkably injurious effect upon the persons who are thus employed, but, after they leave their hands, what myriads of the human race are cut off by them, whilst in the full possession of health, and in the prime of life. To such an inquiry, I am aware that it might be replied that nations and individuals will fight, and destroy each other, and that if deprived of the present more elegant means of doing so, they would still satisfy the noble calls of patriotism, the lust for spoil, and the promptings of ambition, by returning to the use of the sling, the bow, the war club, and the other rude modes adopted by our remote ancestors, and still pursued by impolite communities. Admitting this as an answer, it is much to be apprehended that one of a similar character, and equal in force, might be urged against any scheme, the object of which is to prohibit any trade or calling for the sake of those directly employed in it, as it would be necessary in this case to pursue the effects of the prohibition in its indirect as well as its direct bearings.

Leaving these naughty guns and swords to perform their respective offices, in the hands of those who are commissioned to "burn, sink, and destroy," allow me to direct your attention to those little spears which are never supposed to thirst for life, but whose worst acts are, to occasionally puncture a lady's finger, and to stain a cambric handkerchief. If we examine into the circumstance attending the production of that very harmless article, we shall find that between the period when the steel of which it is made was formed into wire, and that in which, as a finished needle, it is ready to be nimbly plied by the fair hand of industry and beauty, it has committed the most appaling ravages.

We have here taken a manufacture of very great extent, and giving employment to many thousand workmen. Of the persons engaged in the pointing of needles, very few indeed reach the age of forty years, by far the greater number dying under that of thirty-two. The fine particles of steel which are ground off, are so light as to float in the air, and are so copiously deposited upon the mouth and nostrils as completely to blacken them; much irritation is produced by them in the lining membrane of the nose, and at first a copious, mucous discharge is produced from it; but afterwards, the irritability of the parts is exhausted, and they become perfectly dry. The trachea, or wind-pipe, is next affected; respiration becomes difficult, and an habitual, exhausting cough is produced. Soon, nearly all the animal functions are disturbed, the digestive organs refuse to perform their offices, and the lungs, in particular, become the main seat of that total derangement of the whole system which must soon terminate in death. To find a man who has followed this trade for twenty years, is almost impossible.

I have introduced the pointing of needles as an example of the de-

leterious effects of the fine dust of steel, but the like evils are experienced in the making of a great number of other instruments of iron as well as of steel. Forks, for example, are finished by what is called dry grinding; that is, by grinding them upon a stone without water. Numerous utensils, also, of cast iron, when finished on the dry stone, or by fine files, give out a dust producing all the effects which I have described, and in an equal degree. To put a youth to these businesses, therefore, is to bespeak for him an early grave; yet society wants, and must have the articles, and there is no more difficulty in inducing men to follow these trades than there is in enlisting them for the purpose of being killed, *secundum artem*, in the army or the navy; especially if they are to receive a few pence per diem more for this, than for some other species of labour.

Humanity has asked the question, is there no means of preventing, or lessening this evil? and ingenuity has devised a method of accomplishing the object, which it was believed would be effectual. A Mr. Abraham invented what was called a magnetic mouth piece, to be used by the needle pointers, and dry grinders. This consisted of a considerable number of small magnets connected together by a common frame. The magnets were placed within a small distance of each other, and formed a kind of lattice work; when these were strapped upon the face, the air which entered the mouth and nostrils must pass between them, and the ferruginous particles would consequently be attracted by, and adhere to the magnets. As might have been foretold, however, without the gift of prophecy, those for whose use they were intended would not wear them. Several causes combined to prevent their doing so, either of which would have been sufficient to govern the conduct of persons such as we are speaking of; these magnets were costly, and as they must frequently be taken off to be cleaned, they were very troublesome; but, worse than this, they were very ugly, and, worst of all, they excited the laugh, and the jeers of the shopmates of those who wore them. If the philosopher can scarcely scorn the world's dread laugh, he must know but little indeed of human nature who would expect better from the class of men who grind forks and point needles.

I might go on and write a volume without danger of exhausting this subject; but I am not aware that there could be found more apt illustrations than those derived from some of the most necessary trades, most extensively pursued, and most destructive of the health and lives of those by whom they are pursued. In a despotic government, where human life is held cheap, a tyrant may compel an individual to wear an iron mask, without offering a reason why, but in a free government, where the life of every citizen ought to be accounted of inestimable value, the only mode of inducing a man to wear one for his own benefit, as well as to do many other desirable and proper things, is to give to him that degree of education which shall elevate him in his own opinion, and induce him to act from motives more worthy his intellectual nature than those which usually govern persons in walks of life accounted much more exalted than that of the great body of workmen in our manufactories: this is the only reme-

dy upon which I can found any hope; but, were I standing upon the threshold of life, just about to enter upon its duties, and possessing in the commencement of my career the benefit of the few observations which I have made, the little truth I have gleaned in the years which I have numbered, I should even then consider the hope as utopian that I should live to witness the dawn of such a state of things in the humbler walks of life; for, warmly as I now feel in favour of a system of universal education, and great as I believe the benefits which are to be derived from it, I do not entertain a hope that by any effort, merely human, the great body of any community can be so far elevated above the level at which they now stand, as to induce them to act the philosopher in cases of this description. At all events I am fully of opinion that so far as governments are concerned in the regulation of trades and callings, they ought to be, as they generally have been, confined in their action to the prevention of nuisances; that artisans and manufacturers should be allowed to pursue their own business in their own way; and that "Laninez nous faire," should be their motto.

All which is respectfully submitted.

THOS. P. JONES.

Query in relation to the best form of a Lever Beam for a Steam Engine.

TO THE COMMITTEE ON PUBLICATIONS.

GENTLEMEN,—By inserting the following query you will oblige one of your subscribers.

What should be the form of a cast iron lever-beam of a steam engine, so as to afford the greatest strength, with a given weight of material.

Yours, &c.

X.

FRANKLIN INSTITUTE.

Annual Meeting.

The thirty-sixth quarterly, or ninth annual meeting of the Institute was held at their Hall on Thursday, January 17, 1833.

CHARLES C. HAVEN was appointed Chairman.

GEORGE MERRICK, Secretary, Pro. Tem.

The minutes of the last quarterly meeting, and also the minutes of the meeting held this day at 3 o'clock, to appoint the tellers, and open the poll for the election of the officers and managers of the Institute for the ensuing year, were read and approved.

The ninth annual report of the Board of Managers was read, and,

on motion, referred to the committee on publications with instructions to publish it.

The annual report of the Treasurer was also read and accepted.

A number of donations to the Institute were laid on the table, having been received from Mr. M. V. De Moleon, of Paris, France, from Messrs. Judah Dobson, Matthew Carey, and Peter A. Browne, and from the Academy of Natural Sciences.

Professor A. D. Bache, with a view to carry into effect that part of the report of the Board of Managers, relating to the monthly meetings, offered the following resolution:—

Resolved, that the fourth Thursday evening of every month, be devoted to meetings for conversation on subjects immediately connected with the objects of this Institute, in lieu of the formal meetings heretofore held on those evenings,—which was unanimously agreed to.

Mr. S. J. Robbins, on behalf of the tellers of the election, made their report to the chairman, who declared the following gentlemen to be duly elected officers and managers for the ensuing year.

James Ronaldson, President.

Isaiah Lukens, Thomas Fletcher, } Vice Presidents.

William S. Perot, Recording Secretary.

Isaac Hays, M. D., Corresponding Secretary.

Frederick Fraley, Treasurer.

Managers.

Samuel V. Merrick	Alex. Dallas Bache
Abraham Miller	James H. Bulkley
William H. Keating	Alexander Ferguson
Isaac B. Garrigues	Joshua G. Harker
Rufus Tyler	John Agnew
John Struthers	George W. Tryon
Matthias W. Baldwin	John Wiegand
Samuel J. Robbins	William B. Reed
Mordecai D. Lewis	Benjamin Say
Charles H. White	George Fox
Thomas Scattergood	Alexander M'Clurg
Benjamin Reeves	John M. Ogden

On motion, adjourned.

C. C. Haven, *Chairman.*

Geo. Merrick, *Rec. Sec. P. T.*

Minutes of the Board of Managers.

At a meeting of the Board of Managers of the Franklin Institute, held at the Hall of the Institute on Thursday, the 24th of January,

Professor ALEX. DALLAS BACHE was elected Chairman of the Board for the ensuing year, and

Messrs SAML. J. ROBBINS and ALEX. FERGUSON, Curators.

And at a meeting of the Board held on Thursday the 31st January, the Chairman nominated the Standing Committees agreeably to the by-laws. On motion, Professor A. D. Bache was added to the committees on Inventions and on Publications; Mr. C. Gobrecht to the Committee on Inventions; Mr. Jacob Pearce to the Committee on Minerals; when the Committees were appointed as follows:—

1. *On the Library.*

M. D. Lewis
Isaac Hays, M. D.
W. B. Reed
W. S. Perot

2. *On Cabinet of Models.*

John Agnew
Rufus Tyler
Charles H. White
John Struthers
John M. Ogden

3. *On Cabinet of Minerals.*

Isaiah Lukens
Benjamin Say
Abrm. Miller
Thomas Scattergood
George W. Tryon
Jacob Pearce

4. *On Publications.*

A. D. Bache
Isaac Hays, M. D.
Samuel V. Merrick
M. W. Baldwin

5. *On Inventions.*

Samuel V. Merrick
Benj. Reeves
A. D. Bache
Isaiah Lukens
James Ronaldson
M. W. Baldwin
Rufus Tyler
W. H. Keating
John Wiegand
John Agnew
Benjamin Say
Alexander M'Clurg
Christian Gobrecht

6. *On Premiums and Exhibitions.*

Samuel J. Robbins
W. H. Keating
Frederick Fraley
M. W. Baldwin
Joshua G. Harker
Isaiah Lukens
Alexander Ferguson
J. Henry Bulkley
Alexander M'Clurg

7. *On Instruction.*

Frederick Fraley
Charles H. White
Samuel J. Robbins
John Wiegand
Wm. B. Reed
George Fox

8. *Managers of the Sinking Fund.*

Samuel V. Merrick — Frederick Fraley
Alexander Ferguson

9. *Auditors.*

Isaac B. Garrigues — Joshua G. Harker

Annual Report of the Board of Managers.

To the Franklin Institute of the state of Pennsylvania for the promotion of the mechanic arts, the Board of Managers respectfully submit their Ninth Annual Report.

The year just passed has been one of considerable change in the general arrangements of the Institution, and although the details have been given to the members in the progress of the year, by the quarterly reports of the Board of Managers, a general statement of the present condition of the different branches of the institution cannot be unacceptable to the Institute.

The division of the duties of instruction, as communicated by lectures, has been during the present course the same as during the last; and the same portion of time has been devoted to each branch. The regret which the Institute felt in the resignation of Professor Franklin Bache has required the efforts of his efficient successor to efface. It is due to the present professor, Dr. J. K. Mitchell, to state the high sense which the Board entertain of his liberal and successful exertions, but the attention with which a numerous class receives his instruction, must be a more gratifying evidence of success, than can be afforded by this expression of opinion, however favourable. In making the experiment of a division in the course of natural philosophy, the Board believed that they were promoting the best interests of the Institution, and that the efforts for which they called upon the members, in order to second their project, would be afforded with alacrity. The various branches of physics, with all their useful applications, could not be fairly presented in a course limited to a certain number of lectures, and embracing the whole range of natural philosophy, and a natural line of demarcation exists between a course on machines, and on general physics which could hardly fail to be seized by the lecturers, interested in giving efficiency to their courses. A subscription was made, by individual members of the Institute, to effect the purchase of the apparatus necessary to illustrate the course of practical mechanics, and the amount subscribed has been faithfully appropriated: the Board return thanks for the liberality thus manifested, while they must express a deep regret, that from the small number of contributors to this object, hardly a beginning could be made of the collection designated by the lecturer. A list of the subscribers is herewith presented. For this deficiency of apparatus the

lecturer has made every exertion to compensate. The combined courses have certainly added to the interest and usefulness of this department, and if all is not yet accomplished that was expected, the experiment has been sufficient to show the soundness of the views in which it originated.

There have been issued this year, besides the tickets to members, 170 minor's tickets, 68 ladies' tickets, and five stranger's tickets.

The new division of the Hall of the Institute, which has resulted from the surrender of the third floor by Prof. Johnson, has been of great importance to the schools of the Institute, and it may be safely affirmed that their situation is now more favourable than at any previous time. The drawing school is now held in the room originally intended to be occupied by it, the western room of the third floor: this location gives it no inconsiderable advantage, and by increasing the respectability of its arrangements, will no doubt add to the patronage which it now receives. This school has been, as during the last year, entirely under the control of Mr. Geo. Strickland, no appointment of a teacher of ornamental drawing having been made. The number of pupils who have received tickets has been twenty-three; of these twenty-one are minors; and have the privilege of attending the lectures of the institution without additional charge. The division of the third floor has also enabled the connexion between the English school and the institution to be made more close; this school occupies the eastern room on that floor. The thorough system pursued by Mr. Seth Smith, the principal of the school, has not failed to make the due impression upon the minds of the members of the Institute and upon the public, and the school bids fair to meet the wishes of its friends. In relation to the system of this school the committee on instruction have renewed their favourable report. Three of the scholars of last year, who were reported as having been particularly assiduous, received honorary tickets of admission to a course of lectures in the Institute.

The plan by which the contributions to practical science are made by the Franklin Institute, is now well understood, and the Board present a statement of the progress made by the different committees during the year.

The labours of the committee on inventions, ranking high in importance, claim the first attention, as from their nature they are least understood, without the circle of those who have occasion to feel their benefits. This committee have made but three reports through the Journal of the Institute during the past year, and the inference is natural that as, in this age of invention, they must have had more opportunities than these of expressing their opinion, that they have been inactive. But this inference is founded in a misapprehension of their duties. The committee are to serve as counsellors to inventors, not always as reporters. An invention is submitted, and in a personal interview, or by letter, explained by the inventor; it is freely discussed; its novelty and its merits examined. In perhaps a majority of cases, the inventor is satisfied, from the views given him, not to present the invention to the public; in others, the inventor requests

a written report, which he receives, and is often unwilling that it should come before the public, from whom he withdraws the invention. In the small number of cases then, in which an inventor desires the publication of a report, or in which he has brought his invention so far before the public that he cannot retract it, do the reports of this committee appear in print, as records of the time which they devote to their duties.

The committee on publications have devoted, during the past year, to the Journal more attention than could, in reason, be required by the Institute, and the fruit of it has appeared in its pages. Our highly valued editor, Dr. Jones, has not intermitted his labour, and the record of American patents is brought in the December number of the Journal to the month of June of this year, remarks being made by the editor upon nearly every patent, and the specifications of many being given entire.

The committee on the library and reading room have not neglected this interesting branch of the association. Newspapers from almost every state in the Union, the principal journals of our own country, the journals devoted to mechanical science in Great Britain and France, are regularly received, and to be found upon the tables of the reading room. In conjunction with the curators, this committee have greatly improved the accommodation of the room; the models have been removed, and the entire room is now appropriated to the use of readers. An equivalent for the legacy of the late Mr. Warder has been received during the year, and has been invested in books, according to the intention of the testator.

Under the direction of the committee on models, the models of the Institute, and the machinery deposited, have been transferred to the new room on the third floor. This room will be entirely devoted to the reception of models, machinery, &c., and here the Board hope may be made a beginning of the collection of materials, used in the arts, so earnestly spoken of in the last annual report. Machinists will here find a safe and convenient place of deposit, for articles serving as specimens of their work, and the members of the Institute will be gratified and improved by the examination of the various deposits.

The committee on the cabinet of minerals have been occupied in cleaning and arranging the specimens.

The members have already been made acquainted with the causes which led to the postponement of the exhibition of domestic manufactures, and the Institute have given their sanction to the act. The committee on premiums and exhibitions have not suffered the time to pass unimproved, and should their successors finish the work with the same zeal with which it has been begun, much may be expected for the next autumn.

Of the proceedings of the general committees an equally satisfactory account may be given. The committee on water power have finished the publication of their last experiments on water wheels, which they propose to follow up by deductions from the series; and to complete their task by the publication of the experiments, made by them, on the discharge of water. The preparation of the numerous

tables already given to the public has proved that the committee are not averse to labour, and that the delay in their publication has been incident to the nature of the case. Actively employed in business pursuits, the committee have accomplished an extensive series of experiments, and the preparation of the results for publication, within a period less than that which has, in other cases, been considered necessary, to obtain results of much less practical importance, and requiring, in their attainment, much less labour.

The committee on explosions have examined the different subjects proposed in the outset of their inquiries, nearly to completion, but new inquiries have suggested themselves, and required a new devotion of time to obtain the answers to them. An account of the results of the experiments is understood to be in part completed. One branch of their general inquiry deserves specially to be spoken of as involving much delay in its prosecution, namely, that upon the strength of materials used in the construction of steam boilers. The committee have made so extensive a collection of these materials, from different parts of our country where they are manufactured, that more time must be consumed in the satisfactory termination of the examination than would appear possible to those not conversant with such experiments, or who have not visited the experiment room. The committee are understood to be present twice in each week, at their room in the Hall of the Institute, and have repeatedly extended to the members of the Institute an invitation to inspect their proceedings.

The Board of Managers would respectfully submit for the consideration of the Institute, the proposition to change the character of the monthly meetings now held, and to substitute for them conversation meetings. Trial has shown that practical men are unwilling to come forward in a public and formal meeting with the results of their experience, and the present monthly meetings are less and less regularly attended. An experiment could, in the opinion of the Board, be made with advantage, to open the reading room for conversation on the fourth Thursday of each month. At these meetings new machines might be exhibited and explained, new facts in science examined, without the formality attending the present meetings, while the quarterly meetings of the Institute would still afford opportunities for the reading of papers, the formal discussion of subjects, the reports of committees, &c. &c.

The diploma of membership has been completed, and is now ready for distribution to the members. A small price has been put upon it to defray the expenses attending its preparation; the sum cannot be felt as a tax upon individual members, but would have been a deduction from the income of the year, which must have interfered with some portion of the expenditure, for the purposes of the institution.

The Board have had, during the past year, a most disagreeable duty to perform, in relation to the arrearages due by delinquent members; they have felt it a duty to put in force the provisions of the constitution under which they are appointed, and in doing so are fully aware that the measure must be unpleasant in individual cases:

their course was plainly marked out, and they have not felt at liberty to depart from it.

During the year, 126 members have been added to the association, by election, and eleven have become life members, whose names are as follows:—

Frederick Brown
Joseph Drayton
Joseph Parrish, M. D.
Benjamin Smith
John Sartain
Arthur Murphey
H. C. Carey
A. Hart
E. L. Carey
George Gilbert
Reuben S. Gilbert

The Treasurer's report is herewith submitted. By it the receipts for the past year have amounted to $9,791 64, and the payments to $9,249 04, leaving a balance in the treasury this day of $1,021 37.

Isaac B. Garrigues, Chairman.

William Hamilton, Actuary.

A List of subscribers to the collection of apparatus for the lecturer on Machines.

Alex. Dallas Bache
S. V. Merrick
Charles H. White
John Agnew
John Wiegand
M. W. Baldwin
S. J. Robbins
Rufus Tyler
J. G. Harker
John O'Neill
J. H. Bulkley
John Struthers
John C. Trautwine
Frederick Fraley
N. J. Kennedy
W. H. Keating
George W. Smith
Benjamin Say
Edmund Draper
Jacob Farnsworth
John B. Trevor
John T. Sharpless, M. D.
Isaac B. Garrigues
M. D. Lewis
Isaiah Lukens

Bibliographical Notice.

American Almanac and Repository of Useful Knowledge, for the Year 1833.* Boston, published by Gray & Bowen.

This valuable work has just reached our city. It is the fourth number of a series, the commencement of which may be considered to have formed a new era in works of this sort. With much of the scientific information presented by the elaborate astronomical epheme-

* This notice, which was prepared nearly three months since, has been mislaid; we insert it now from the consideration that justice should not be entirely withheld, because accidentally delayed.—Com. Pub.

rides of Europe, this work presents other useful general information; it is a Repository of Useful Knowledge, as well as an Almanac.

The patronage of astronomical science and of general information is, probably, not yet sufficient in amount to command separate annuals; but this work, occupying both grounds, should, surely, be well supported. We subjoin a list of the contents.

PART I.

Calendar and Celestial Phenomena for the year.—Signs of the planets: chronological cycles: signs of the zodiac: length of the seasons: ember days: moveable festivals of the church in 1833: Jewish calendar: Mahometan calendar: eclipses in 1833: occultations: eclipses of the satellites of Jupiter, 1833: aspects of the planets in 1833: height of the greatest or spring tides: tide table: latitude and longitude of places in the United States: length of the longest and shortest days in several cities in the United States: calendar, January, &c.: Ephemeris of the sun: true and apparent places of the principal fixed stars: elements of eclipses and occultations: elements of occultations, &c.: Young's refractions: table of the sun's parallax and altitude.

Meteorological Information.—Red snow of the Alps, &c.: showers of dust and of soft substances, both dry and liquid: meteoric stones: mirage: halos: parhelia or false suns: lightning rods.

PART II.

United States.—Address of George Washington at his inauguration as president of the United States: executive government: regulations in relation to patents, copy rights: act for the relief of insolvent debtors to the United States: act for the relief of officers and soldiers of the revolution: congress of the United States: public lands: intercourse with foreign nations: the judiciary: commerce: tariff of duties: bank of the United States: public debt of the United States: receipts and expenditures: estimated receipts in 1831: mint: rates of postage: coffee trade: colleges in the United States: theological seminaries: medical schools: tabular view of education: religious denominations: census of 1830.

Individual States.—Maine: New Hampshire: Vermont: Massachusetts: Rhode Island: Connecticut: New York: New Jersey: Pennsylvania: Delaware: Maryland: Virginia: North Carolina: South Carolina: Georgia: Alabama: Mississippi: Louisiana: Tennessee: Kentucky: Ohio: Indiana: Illinois: Missouri: District of Columbia: Florida Territory: Michigan and Arkansas Territory: Governors of the states, &c.: state legislatures, &c.: table of elections, &c.

Independent States.

Europe.—Reigning sovereigns of Europe: statistical table of Europe: naval forces of Europe: cultivation and produce of Europe: mineral productions: Sweden and Norway: Russia: Denmark: Belgium: Holland: Great Britain—England, Scotland, Ireland: France: Prussia: Saxony: Wurtemburg: Bavaria: Austria: Switzerland: Spain: Portugal: Sardinia: Two Sicilies: Turkey.

Commerce of the United States: chronicle of events: progress of the cholera.

AMERICAN PATENTS.

LIST OF AMERICAN PATENTS WHICH ISSUED IN JULY, 1832.

With Remarks and Exemplifications, by the Editor.

1. For an improvement in the *Process of manufacturing White Lead;* Edward Clark, Civil Engineer, city of New York. First patented December 4th, 1828. Surrendered and reissued on an amended specification July 3, 1832.*

(See specification.)

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2. For machinery for *Sawing, flatting, moulding, beading, and polishing marble,* and other kinds of stone; Isaac D. Kirk, city of Philadelphia, July 3.

A circular stone saw, that is, a saw without teeth, is to be placed on a shaft to run vertically; and by means of a toothed wheel and pinion a rapid motion is to be given to it. The marble, or other material to be wrought, is placed upon a carriage below the saw, and by raising or lowering this carriage, the piece may be cut either partially or entirely through.

In the forming of mouldings, beads, &c. wheels of copper, brass, pewter, iron, or other metal, are to be substituted for the saw; the face of such wheel being brought into the proper shape. Sand and water are to be allowed to drop from a hopper on to the work.

There is no claim made, but the patentee says that "it is in part an old machine, but applied to a new purpose."

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3. For an *Alarm for Watches or Time Pieces;* Robert Wilson, Williamsport. Lycoming county, Pennsylvania, July 3.

About six or seven years ago, numerous alarms were made and described in the journals of the day, or secured by letters patent, which alarms were to be operated upon by a common pocket watch. The arbor of the minute hand was made to pass into the end of an arbor attached to the alarm, and formed like a watch key. Provision being made for setting the alarm to ring at the appointed time, and the watch being left in its place, when the hour arrived a pin was made to disengage a spring, which was thus set at liberty, and, in its unwinding, caused a bell to ring.

The present machine is one of this description, but as it does not recommend itself by greater simplicity than was possessed by several of its defunct predecessors, and only accomplishes the same end by a change in the arrangement of the wheel work, it does not require a particular description.

The claim made is to "the before described alarm for watches, or time pieces, particularly the watch work, fly, and mainspring."

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4. For a *Winnowing Mill;* Daniel Davis, Cornish, Sullivan county, New Hampshire, July 5.

* Reissued since on an amended specification.

The principal improvement claimed on this machine is in the form given to the leaves of the fan, which stand spirally round their axis, like those of a smoke jack. These, it is said, draw and press the air obliquely through the mill with a steady current. Riddles, or sieves, are formed by punching holes of the size required, through thin sheet metal, or parchment. These, with the manner of forming the shoe, are the only novelties mentioned.

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5. For an improvement in the *Double-iron Plane;* William B. Reynolds, St. Clairsville, Belmont county, Ohio, July 7.

Although some pains have been taken by the writer of the description of this improvement, it is yet somewhat obscure. The object, however, is to use set screws to adjust pieces upon the plane iron so that they shall fit into corresponding mortises on the cap iron, in order that it may at once fall into its right place. The mode of effecting this, seems to us more complex than necessary. We have, in fact, seen a much more simple arrangement for the same purpose; still, the common method is certainly susceptible of improvement.

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6. For an improvement in the *Mode of pointing Pegs and pins;* James Hall, North Bridgwater, Plymouth county, Massachusetts, July 7.

The points upon pegs, or pins, are to be formed upon the face of the block, before the pegs, or pins, are split out. To effect this, a shaft carrying the necessary cutters, is made to revolve horizontally. These cutters may be formed of plates of steel, like circular saws, but having their edges bevelled in such manner as shall give to the point of the peg the form which may be required. A number of cutters of this description may be passed on to the shaft, and held there by a screwed nut. Instead of so forming the cutters, grooves may be made around a steel cylinder, and the teeth be formed by filing across them. The patent is not taken for any precise mode of making the cutting tool, but for the modes of construction whereby a circular motion is given to the teeth when in operation, and thus forming the points, as set forth in the specification.

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7. For a *Thrashing Machine;* M. L. Flaglor, city of New York, July 7.

A feeding cylinder of eight or ten inches in diameter, and set with spikes like those on the beating cylinder, is to draw the grain from the feeding board, and carry it between the beating cylinder and the concave. Between the feeding board and feeding cylinder there is an open space to allow stones, or other hard bodies, to fall through. A cover is extended over both cylinders. The claim is to "the position of the feed board in relation to the front cylinder, by means of which stones and other articles improper to pass into the machine, are suffered to drop to the ground. The *association* and *position* of the front cylinder, with the arch cover of said cylinder, by means of which the

grain is carried over to the beater, and the dust prevented from blowing upon and suffocating the person who feeds the machine."

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8. For a *Machine for Napping Hats;* Gerrard Scott Petty, and Hiram Wortham, Lancaster, Gerrard county, Kentucky, July 9.

A cylinder is made by taking two round heads and uniting them by slats extending from one of them to the other; the heads, and also the slats, are to be covered with cloth on the inside, and the hats to be napped are placed within this cylinder. A box which contains hot water, and which has a small boiler below it, is made of such size as to allow the cylinder to revolve within it. Four troughs, or buckets, placed edgewise upon the cylinder, extend along it from head to head, and as the cylinder is made to revolve, these dip up the water, and pour it upon the hats.

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9. For an improvement in the *Corn Harrow, and Grain Cultivator;* Nathan Stantor, jr., Florida, Montgomery county, New York, July 9.

The first claim made is to the form given to the teeth, which are to have a cutting edge in front, being made angular, instead of flat, upon the face. The second is to a shoulder made round the neck of the tooth, to serve as a brace to it. The third is to fastening the teeth to the frame by means of a screw and nut, instead of by a key. There are some other things of the same character, and of about equal importance, but we think it unnecessary to carry the enumeration any further. Be it remembered, however, that if any one has made the cultivator teeth with angular fronts, or has fixed them to the frame by means of nuts and screws, they will, by so doing, have rendered this patent null and void.

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10. For an improvement in the mode of *Manufacturing Oakum from Junk;* Ebenezer Cook, Haddam, Middlesex county, Connecticut, July 9.

The patentee sets forth in his petition that he has invented a mode of softening the junk from which oakum is to be manufactured, which is very superior to that heretofore followed, which consisted in allowing it to stand for a considerable length of time in kettles containing hot water; that in the new process the water into which the junk is thrown is put into rapid motion, whereby the fibres of the junk are so far separated as to render the picking easy, and at the same time, the oakum is of a very superior quality.

The machinery ordinarily used by him consists of a cistern, or vat, resembling the vat of the beating machine used in paper making. In the place of the revolving cutters, or beaters, there is a paddle wheel, the revolution of which keeps the water and junk placed in the vat in constant motion. A furnace is so fixed at one end as to keep the water constantly heated, and the whole is covered to prevent evaporation.

The claim is to the method or principle of making oakum, and preparing the junk for that purpose by *keeping it in motion or circulation in hot water*, in the manner hereinbefore described, or by different machinery, or in any other manner."

The description is drawn up with much clearness, and the claim very distinctly made. We are always gratified when we meet with papers of this character, as in the greater number of instances the interest of the patentee is put in jeopardy from defects in these points.

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11. For an improvement in *Rail-Road Carriages;* John C. Blanvelt, Rockland county, New York, July 11.

This carriage, like that patented by Samuel T. Jones, and described in vol. v. p. 149, is to run upon two wheels only. The gudgeons of these wheels work in slots which prevent them from having any bearing above or below them, although they are checked by the sides of the slots. The axis of each wheel has its bearing upon the peripheries of two friction wheels, placed above it, one on each side of the main wheel.

A jointed rod serves to connect two such carriages together, the joints allowing of a lateral, but not of a vertical motion. The box or body of the carriage, is suspended between the wheels, the axis of the latter not crossing from side to side, but each wheel having its own axis supported by a frame on the side of the body.

We really are at a loss even to guess what is intended to be patented in the present instance. There is nothing new in the friction wheels, in the running upon two wheels only, in the connecting of two such cars by a jointed rod or in the frame for the wheels; the whole being included in the patent of Mr. Jones above alluded to.

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12. For a *Cooking Stove;* David Gassner, city of New York, July 11.

Cast, or sheet iron, may be employed in the construction of this stove, which is designed principally for the burning of anthracite. The grate is to be made of bars, and occupies the centre of the stove. On each side of it there is an oven, so placed that the heated air of the stove may circulate below, above, and around it. Holes in the top admit boilers, &c. to be placed over the fire, and through one of these the fire is to be fed; at least we suppose so, seeing no other provision for that purpose.

Our readers may be ready to inquire after the supposed novelty in the construction of this stove; the patentee is himself silent upon this point, and we shall not presume to speak for him. All we can say respecting it is, that we do not know of another stove exactly in the same shape as this.

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13. For an improvement in the *Mode of Ornamenting the Walls and Floors of Rooms, &c.;* Thomas Boynten, Windsor, Windsor county, Vermont, July 12.

The mode of ornamenting here proposed is denominated *Elastic*

Stamp Painting. The elastic stamp is made by casting a mixture of glue and molasses, like that used for the making of inking rollers.

A reversed mould is to be made and oiled, and upon this the composition is poured. It should be about half an inch in thickness when on the mould, and after it has been cooled and removed from it, it is to be fastened on to a piece of wood, the face of which is cylindrical, and having its back furnished with a handle. The composition mould is to be painted to prevent its drying too hard. To use it, the colour is to be spread upon a pallet board with a brush, the mould applied to it, and the colour then transferred to the wall, &c. by giving a rolling motion to the elastic stamp.

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14. For a *Stereotype Block;* Abiel Chandler, Concord, Merrimack county, New Hampshire, July 13.

This block is to be made of mahogany, and to have its edges covered with plates of iron, or brass, in the usual manner. The shanks of the moveable hooks are forced off by spiral springs which surround them, and thus relieve the plate when it is intended to be removed. A steel spring, which is a longitudinal strap, extends from one of these hooks to the other, and serves to keep them up to their bearings when the plate is on. An eccentric button, or cam, is placed so as to operate against the middle of this spring; and a notch in the end of it, admits a common screw driver, by the turning of which the catches are forced forward, or released.

The claim is to the use of the cam and spring as described, for the purpose of imposing, or fastening, the plates on to the blocks.

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15. For a *Socket Spade;* Charles Richmond, and Samuel Caswell, jr., Taunton, Bristol county, Massachusetts, July 13.

(See specification.)

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16. For a *Double Milk Can;* Artemas Crittenden, West Turin, Lewis county, New York, July 14.

Two milk cans are to be prepared, one of them about two inches less in diameter than the other; this is to be placed within the larger, preserving the same distance between their bottoms. The space between these is to be filled with cold water, when milk is to be kept cool, or in winter warm water may be put in to prevent its freezing. A cover is made which fits exactly into the inner can, and slides up and down in it like a piston. There is a screw for raising or lowering this cover, and retaining it in its place, and a close shutting door is hinged on the top of this cover, which may be opened when milk is to be dipped.

The use of this inner sliding cover, is to keep the milk from being dashed about, whatever motion may be given to the can; for this purpose the cover is to be forced down so as to come in contact with the surface of the fluid; whenever, therefore, a portion of the milk is dipped out, the screw is turned, and the required pressure made.

The claim is to the double can, and the moveable cover.

17. For an improvement in the *Grist Mill;* Joseph C. Gentry, city of Philadelphia, July 14.

Another portable grist mill is here presented to us, which differs from those before patented, principally, in the mode of holding down the running stone; there are some other points of difference particularized, but viewing them as of minor importance, we shall describe only the former.

A flat bar of iron crosses from side to side of the frame, the spindle revolving within a hole made in the middle of this bar. There is a shoulder, or collar, upon the spindle, close under the bar, and bearing against it. The two ends of the bar are perforated so as to allow it to slide up and down upon two round bolts of iron. These bolts are surrounded by spiral springs above the bar, which press it down, and cause it to bear upon the spindle collar. The upper ends of the springs bear against nuts, which being tapped press upon the bar, may be screwed down to increase the pressure.

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18. For a *Double Coffee Mill;* Thomas W. Witherby, and Joseph Torry, Millbury, Worcester county, Massachusetts, July 17.

The difference between this mill and the cast iron vertical coffee mill used by most persons, consists in its being furnished with two revolving toothed nuts, covered by two corresponding shells. One handle serves to turn both; and one regulating screw to set them. The hopper has a moveable partition in it, allowing two different articles to be ground, without their interfering with each other; or, of course, both may be used for the same article.

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19. For a *Washing Machine;* Watson W. Woodburn, Greensboro, Guilford county, North Carolina, July 18.

A cylinder about eighteen inches in diameter is made to revolve in a suitable trough. The surface of the cylinder has on it a number of semi-cylinders of about an inch in diameter, and placed an inch apart. Within the trough there is formed a concave, which consists of rollers turning upon gudgeons, and between these rollers and the rounds on the large cylinder, the clothes are to be washed. The frame which sustains the concave, rests upon spiral, or other springs.

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20. For a *Washing Machine;* Isaac S. Wright, Weedsport, Cayuga county, New York, July 18.

(See specification.)

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21. For an apparatus for *Separating Iron Ore from any extraneous matter*, called a "separating machine;" Joseph Goulding, Reeseville, Penn county, New York, July 18.

The design of this machine is to employ magnets for the purpose of separating the available ore from the extraneous matter with which it is mixed. To effect this the ore must be pulverized before passing it through the machine. Those who are acquainted with the nature

of ores will at once perceive that the apparatus spoken of cannot be applied to them indiscriminately, but to those only which are denominated magnetic. There is much iron ore, of excellent quality, which does not possess this property; and sometimes these and the magnetic ores are to be found in the same mine. In either of these cases the machine to be described cannot be usefully applied.

A hollow cylinder is to be made, which, in the machine referred to in the specification, was about four feet long, and two feet eight inches in diameter. This cylinder has no gudgeons, but its periphery rests upon those of two cylindrical rollers, and motion being given to these the cylinder is also turned. It is lined throughout with short magnets, confined in their places by means described in the specification. The cylinder is a little inclined, like a bolting screen, and the pulverized ore being introduced at the elevated end, the refuse matter escapes at the other. In its passage, the magnetic ore adheres to the magnets, and from these it is swept off by a revolving brush, into a trough passing through the cylinder.

The patentee claims as his invention, "the hollow cylinder prepared as before described, and the manner of separating the ore therefrom within the said cylinder."

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22. For a *Machine for Sawing Circles;* Thomas Armstrong, Anderson, Hamilton county, Ohio, July 19.

We suppose that the circles mentioned in the title of this patent, are merely circular segments intended as felloes for wheels, or other similar articles. This apparatus could not be applied to the sawing of a circle, whether made as described in the specification, or as shown in the drawing. A saw is to be strained in a frame in the usual way, and worked by a pitman between fender posts. The carriage to support the timber, works upon a pin, which is to be the centre of the segment to be sawed.

Excepting in the form given to the framing, there is no difference between this machine, and several others for which patents have been taken.

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23. For an improvement in *Stoves for Burning Coal;* Ephraim Baldwin, Gibbonsville, Albany county, New York, July 19.

"The principle of the improvement consists in connecting an oven with the stove in such a manner as that the fire shall communicate to it a sufficient degree of heat for the purpose of baking, cooking, &c., and at the same time leave the stove, as to its ordinary structure and purposes, unincumbered by the same."

The mode in which this is to be accomplished is to lengthen the top plate of the stove, or furnace, so as to extend out behind the usual square body, and upon this plate to construct an oven, around which the flue is to conduct the heated air. There are suitable openings in which to place kettles for boiling.

We have given, in the words of the patentee, the object of his patent, and, in our own, a brief exposition of the means pursued by him

in attaining it. We see but little more in it than one of those variations in form of which stoves acting upon the ordinary principles are susceptible to an indefinite extent.

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24. For a *Machine for punching holes in Raw Hides or other hard material;* William Angell, Providence, Rhode Island, July 19.

The patentee informs us that the machine which he describes has been heretofore used by him only for the purpose of punching the holes through power loom pickers, to receive the wire which holds the pickers together; but although it may have been used by him for that purpose only, a machine very similar to it has been long in use for a great variety of purposes. The fact is that it is the common screw press furnished with such punches as adapt it to pricker leather, and such a bed as suits the work to be done. It is observed that the screw may be dispensed with, and a lever, heart, or other motion, employed, and the machine is claimed in either of these cases.

If the particular construction of the bed, adapting it to a special purpose had alone been claimed, the claim might have been good, but we see no discrimination in this particular, the terms employed embracing every thing described.

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25. For a *Cotton Spreading and Picking machine;* John C. Whitin, Northbridge, Worcester county, Massachusetts, July 20.

This spreading and picking machine is constructed like some others now in use, but the wire cylinders are to have a flanch, or heading, on each end, projecting about two inches, so as to retain the sheet or lap of cotton, with a smooth, compact edge. All the moving cylinders, rollers, &c., excepting the beaters, are to be geared, and these are to be run as usual by straps. The claim is to "the application of gearing to the several movements, instead of belts, and of the flanch or rim to the ends of the several wire cylinders."

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26. For a *Coffee Mill;* Ammi Clark, Berlin, Hartford county, Connecticut, July 20.

We are told by the patentee that his improved coffee mill is made of cast iron, "and consists principally of a double runner, two shells, an axle or shaft, and a crank."

By turning to No. 18, it will be seen that a patent was granted for a coffee mill which was "furnished with two revolving toothed nuts, covered by two corresponding shells." It seems, however, that this last was not the original double mill, as the present patentee, whose papers have lain some weeks in the patent office, says that he does not claim "the double mill heretofore invented and said to be patented by a person unknown, having shells with radiating teeth," &c. &c. but he claims only the peculiar construction of his own; by which nearly double the work can be accomplished in a given portion of time."

We apprehend, however, that this double labour will not be accomplished with the same degree of power, although something may be saved in this particular, as regards friction.

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27. For an improvement in the form and construction of *Gridirons;* Fenner Bush, Meriden, New Haven county, and Linus Pratt, Middletown, Middlesex county, Connectictut, July 21.

In the first part of the specification of this patent we are informed that the improvement consists in so constructing and arranging the parts of the gridiron as to preserve the pieces of meat which may be broiled on them; so shaping them as that the whole may be made of cast iron, or composition metal; and that the principle is equally applicable to the instrument whether made round or square.

The square gridiron is to be cast in one piece, with the bars fluted, and leading into a trough which runs along the front, or handle end, of the gridiron, which trough is to receive the gravy that runs along the flutes of the bars. The round gridiron has the bars radiating from the centre, towards which they descend, the upper surface being dishing, or concave. This revolves upon a pin projecting from the lower piece, or stand, of the gridiron, which is cast so as to catch and retain the gravy.

We have before had occasion to notice gridirons upon this principle, and have known them for upwards of forty years. The patentees are aware that the general plan is not new, but state that they have heretofore been made wholly, or in part, of wrought iron, and that although gridirons have been sometimes made of cast iron, yet these have not received the form requisite to preserve the gravy. They claim, therefore, the casting the square gridiron in one piece, and the round one in two pieces, in the way which they have specified.

To us it appears, from the evidence of the patentees themselves, that there is nothing new in the principle, or general plan of the instrument, nor in the material of which it is formed, but that they are the first who have made patterns to cast such gridirons as have heretofore been made of wrought iron, giving them, of necessity, such a form as would enable them to deliver from the mould.

We have repeatedly expressed the opinion that a claim of this description does not include such an amount of novelty either of invention or discovery as is requisite to become the secure foundation of an exclusive right.

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28. For a *Machine for Grinding Cylinders which require to be perfectly straight and true,* called a "Traverse Grinder;" Jonathan Bridges, Troy, Bristol county, Massachusetts, July 24.

Steel and other cylinders, are frequently ground perfectly true by fixing a stone, or other grinder, upon a shaft parallel to that of the cylinder, and causing it to traverse from end to end of the cylinder; a rotary motion, generally in opposite directions, being given to each. The shaft of the grinder is, in this case, made cylindrical, that it may

slide within collars at either end of the machine. The shaft of the grinder must, necessarily, be at least double the length of the cylinder to be ground. The present invention is for an application of the same mode of grinding, but by machinery which is differently arranged. The shaft upon which the stone, or other grinder, is placed, does not traverse backward and forward, but the grinder itself slides from end to end of the shaft. The latter is made cylindrical, and is grooved from end to end, and a piece projecting from the hole in the grinder into the groove, prevents it from turning round upon it, and guides it as it traverses along. There are pulleys placed upon the shaft of the cylinder to be ground, bands from which give motion to the grinder shaft. The apparatus which gives the traversing motion to the grinder, would require an engraving for its perfect explanation. The claim is to the particular arrangement of the machinery by which this is effected.

It is contemplated to apply this instrument to the grinding of cylinders of all kinds, whether of wood or metal, and particularly to piston shafts and card cylinders. In grinding cards it is observed that it may be fixed in the place of the doffer cylinder, and moved by means of a bolt from a pulley on the main card cylinder shaft, its construction admitting of its being carried to the body to be ground.

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29. For a machine for *Hulling Clover Seed;* George Wales, Centre Township, Union county, Pennsylvania, July 24.

On looking at the drawing appended to the specification of this patent, we immediately recognized the machine as similar to one which we had previously described; in the greater number of cases this would not have been a noticeable circumstance, but there was much of novelty in the form of the original, and of course something to be remembered. In the progress of improvement two great geniuses may and sometimes do, without any communication with each other, make the same discovery: full of impressions of this kind, we sought for our notice of the original patent, and found it at p. 156 of our last volume. If we were struck by the similarity of the two machines, we were still more surprised at the coincidence of the residence of the two inventors, both of whom have their address, New Berlin, Union county, Pennsylvania. Some malignant spirit might dare to suggest the idea that as the patents bear date more than four months apart, one of them might be a borrowed plume; far be it from us to suspect any such thing; the patentees have both sworn that they are the true and original inventors, and that's enough.

In the notice of the former patent, it was stated that a spiral row of wooden pins was placed round the cylindrical part of the shaft, and that these were for conveying the heads to the rubber; instead of pins set spirally, the present patentee prescribes a continuous projection, like the thread of a screw, and we are informed that "the revolving screw-formed cylinder is for conveying the clover to the rubber, where the seed is rubbed out. The former description, excepting in this immaterial point, will serve for the present machine

most perfectly. The claim made is to "the before described machine for hulling clover seed, and chopping grain, particularly the revolving screw-formed cylinder, or conveyor, and its case or cover, made of any material whatever."

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30. For an improved mode of *Straining Buck Saws and Bow Saws in their Frames;* Teunis V. Leroy, and Abel Sandford, Newport, Herkimer county, New York, July 25.

Wood, and other framed saws, are usually strained by means of a twisted rope, instead of which the present patentee proposes to use iron screws. Iron wire sufficiently stout is to be bent so as to form a loop, the two ends of the wire uniting in a screw nut. There must be two such loops, one to pass over the head of each end of the saw frame. The nuts are to be tapped with a right and left handed screw, and an intermediate rod, tapped to fit them; this, when turned by hand, will strain the saw.

The improved construction is particularly described, and is limited to the precise mode noticed above. Any claim, in fact, which would have embraced the tightening by means of a nut or thumb screw, generally, would have been void, as saw frames have been frequently so made. We do not see the necessity of a right and left handed screw, even when the tightening rod is made with loops, and an intermediate rod uniting them, as proposed by the patentee; for the same end would be answered by screwing one end, and making the other to swivel; and according to the terms of the specification, the patent would not be violated by this modification. After all, however, we believe a rope to be the best means of tightening saw frames; its elasticity having a favourable influence in the operation of sawing, and, we have no doubt that, in the case of catching, it tends to preserve the saw from breaking, especially in narrow turning saws.

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31. For a *Machine for Cramping Boots;* Lewis Lucas, Barre, Washington county, Vermont, July 25.

A cramp, made nearly in the usual form, is fixed in a groove between two uprights, forming a part of the cramp frame, the edge over which the leather is to be forced standing uppermost. The clamps which are to embrace the cramp, and force the leather over it, are made either of wood or iron, and they are hinged by their upper edges to a follower, which slides up and down in the frame. By means of a screw bolt and nut passing through them, they are gauged so as to adapt them to the thickness of the leather. A screw passing through the head block of the frame serves to force the clamps down. The lower edges of the clamps are provided with holes to enable the workman to tack the boot conveniently.

There is no claim made, and we are not therefore informed what constitutes the improvements; the general plan is not new.

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32. For a *Cooking Machine* for roasting, baking, and frying

meat, bread, pies, and pancakes; James Bennet, Brutus, Cayuga county, New York, July 25.

This whole affair is but a modification of the ordinary tin kitchen. The lower part, however, is to be made so as to detach it from the upper tin reflector, and is to be in the shape of a common dripping pan. The patentee says that it is "to be about as wide again as it is long," which we confess sets at nought all our conceptions of length and width, but in a patented contrivance this may be admissible, especially when there is but little else in it that is novel.

A spit is to pass through the tin oven; hooks are to be provided on which to hang birds or other dainties; a handle is to be properly placed, and other appendages used which may be found convenient. Instead of the dripping pan which usually forms the bottom, one with fluted gridiron bars is to be substituted when broiling is to be performed; the machine must, in this case, be put over the coals. A tin reflector is to be placed over the gridiron "to draw the heat so as to cause both sides to cook at the same time;" how this and the tin kitchen are to combine their reflective powers we do not perceive. Excepting in the title, we hear nothing respecting pies, bread, and pancakes; this is to be regretted, as they are in very general favour. The inventor makes no claim to the part, or parts, invented by him, leaving it to the sagacity of others to discover the secret.

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33. For a *Machine for Churning;* James Bennet, Brutus, Cayuga county, New York, July 25.

This is the common dasher churn, the staff of which is to be worked up and down by machinery. An upright post is framed into a plank upon which the churn stands. Two iron cog wheels, one, two, or three times as large as the other, are to mash into each other, the larger being turned by a winch, or handle. A fly wheel, from ten to eighteen inches in diameter, is fixed upon the shaft of the smaller wheel, and a pin attached to one of the arms of this fly wheel forms a crank that carries a pitman, the other end of which works the dasher staff.

All these parts are fully described, and properly delineated, but, as in the case of the "cooking machine" last noticed, we are not directed to the points of novelty, and, without a finger post, we cannot find our way to them.

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34. For a *Machine for Cutting, Slitting, and Punching Iron,* and for trimming hoes, saw plates, jointing, cutting the teeth, and gumming saws; James Bennet, Brutus, Cayuga county, New York, July 25.

The body of this machine is a block of cast iron of such size as may be required by the nature of the work to be performed. A lever, secured to this by a proper bolt, is to force down dies, punches, or cutters, adapted to their respective purposes. A spring attached to the sliding bolt which carries the dies, or cutters, may be employed to raise them when the lever is raised.

We must again offer an apology to our reader, and, we suppose, to the inventor also, for the visual film by which the novelty of the contrivance before us is obscured. The thing looks so much like numbers that we have seen in different work-shops, which have been figured in various works, and which we have more than once described as forming the subject of a patent, that we are altogether unable to discover its novelty, excepting in the averment of the petition to the Secretary of State.

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35. For machinery for finishing the ends of *Bobbins or Spools;* Simeon Presbury, jr., Canton, Norfolk county, Massachusetts, July 26.

This patent is taken for an apparatus used in finishing off the ends of the bobbins or spools used in spinning machines, so as to render them perfectly true and uniform, and to correct them should they become untrue, by warping, or otherwise. The patentee states that the inconvenience frequently experienced from the irregular draft of the spools, results, in general, from a want of truth in the ends of the bobbins, a defect which this contrivance is calculated to remedy.

The apparatus consists of a mandril, or pin, of the size of the spindle upon which the bobbin is intended to run. Upon this he fixes cutters, usually three, which stand at right angles to the pin; or they may vary from a right angle when required. An enlargement, or hub, is made upon the pin, for the purpose of attaching the cutters, or they may form one piece with the hub, which may slide on to the pin, and be secured there, whilst it is capable of being removed to sharpen the cutters.

The claim is "to the application of the aforesaid revolving cutters, or other modification thereof, to the making or repairing of all kinds of bobbins, or spools, used in spinning."

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36. For a *Machine for hulling Clover Seed*; Pierson Reading, Trenton, Hunterdon county, New Jersey, July 31.

The hulling part of this machine consists of two cast iron frustrums of cones, fitting one within the other, and furnished with teeth like those of the old fashioned coffee mill. The outer cone may be about a foot in length, ten inches in diameter at the larger, and eight at the smaller end. A piece is cut out at one end of it to allow of the feeding from a hopper; it is fixed horizontally in a suitable frame, and the inner cone revolves within it, at such distance as shall cause the hull to be rubbed off without bruising the seed.

The claim is to the outer and inner cones, with teeth placed spirally in opposite directions, and made sloping on one side and straight on the other.

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37. For improvements in the *Apparatus for applying either Simple or Medicated Steam to the surface of the Human Body;* Boyd Reilly, city of Philadelphia, July 31.

A patent was obtained by Mr. Reilly, on the 5th of February,

1831, for an apparatus upon which the present is for an improvement. The principal object appears to have been the rendering the apparatus more portable than it was in its original form. Instead of being in one length, it is now divided into three, which are made to fold together, so that it can be packed in a case of moderate size, for transportation. The lamp, and the tubes for the supply and discharge of the vapour, have also undergone some alteration, with the same intention. The patentee has devoted sixteen pages to the description of his improved apparatus, giving the precise dimensions, and the modes of joining all the parts used by him. As these are mere matters of arrangement having nothing to do with the principle of action, which remains unchanged, we think it altogether unnecessary to specify them.

We are left to infer in what the improvements consist, and that they are actually simply the whole of what is described and figured, there being nothing in the form of a claim. Besides the portable apparatus, however, a fixed one is figured and described; but the particular points in which this differs from the former are not explained, and it appears that they consist merely in rendering it more elegant and convenient. That the whole of the improvements now described are viewed as improvements, appears from the references given to the drawings, which are called "references to improvements." These consist of "a large portable apparatus,—the machine packed up,—tin case for do.—escape pipe drawn out—improved cap—lamp fixed for use—do. packed up,—stretching rails and fastenings, with holes for ends of bows—fixed apparatus—portable do. for the limbs—do. cone joint."

When speaking of the former patent, we took the opportunity of expressing our disapprobation of the empirical employment of agents of great activity. In the hands of ignorant persons machines of this description have been extensively used; like all active, quack applications, its victims have been numerous, and they have frequently been increased by the humane exertions of intelligent men to stay the evil. In the hands of the scientific and experienced physician, there are but few of the advertised medicines which may not be used advantageously, as they are, in fact, nearly all of them, compounded from his occasional prescriptions; but that which would relieve a patient to-day, may kill him to-morrow, the state of the system having undergone some material change. It of course sometimes happens that these quack medicines are administered at the time when they are suitable, and it is thus that their credit is sustained. If the patient lives it is the medicine which cures, if he dies, the fault is in the disease: now all these remarks apply to the particular apparatus in hand: in hospitals, and under the direction of the physician in his general practice, the vapour of water, of alcohol, and even of sulphur, applied to the body, will produce the most beneficial effects, and they have all, as well as others, been repeatedly so employed.

Were we asked why we have written these lucubrations upon this subject, we could scarcely give a satisfactory reply; perhaps it is because we are under the influence of the genius of cholera, which has

just been, and is at this moment, committing the most appalling ravages at our very doors, having been assisted in the work of destruction by the demon of ignorance and interest, whilst the science and skill that have combatted with, and often successfully repelled, the deadly foe, have not unfrequently been treated with ingratitude and insult.

SPECIFICATIONS OF AMERICAN PATENTS.

Specification of a patent for an improvement in the manufacture of White Lead, and other metallic salts. Granted to EDWARD CLARK, *of the city of New York, Civil Engineer; dated December* 4, 1828. *Surrendered and reissued on an amended specification, July* 3, 1832.

To all whom it may concern, be it known, that I, Edward Clark, of the city of New York, have invented or discovered a new and useful improvement in the manufacture of the metallic salts, usually denominated white, or carbonate of, lead, carbonate of copper, acetate of lead, acetate of copper, and the acetate, or peracetate of iron, and that the following is a full description thereof.

As the process to be performed depends upon the same principles, which ever of the salts in question is to be manufactured, with no other difference than that which will suggest itself to any chemist, I shall confine myself, in describing my mode of procedure, principally to the manufacture of white lead.

In preparing white lead, or other metallic salts, I construct cisterns, or apartments, which I denominate corroding cisterns, or apartments. The corroding cisterns may be made of wood, or of brick, or stone-work, or otherwise, either cylindrical, square, oblong, or in any other shape. When cylindrical, I have usually made them about six or eight feet in diameter, and the same in height. I find them more convenient, however, when made oblong, about eight or ten feet high, three or four feet in width, and fifteen or twenty feet in length, as the slats, or shelves, upon which the metal to be corroded is placed, or suspended, are more readily supported upon cleats attached to the sides, than they are when the width of the cistern is greater; the metal also appears to corrode better in cisterns of this form. Shelves of slats, or laths, or plank perforated with numerous holes, or of small scantling, or of strips of wood of sufficient strength, supported by cleats, are placed one above the other, at convenient heights, and when white lead is to be made, the metallic lead, made into sheets, is placed upon the shelves in coils, or is suspended from the slats, or otherwise so disposed of that the whole, or nearly the whole, surface of the lead may be exposed to the action of the vapours by which it is to be converted into white lead. When the lead is so disposed, the vapour and gases which are to effect the required changes are introduced into the corroding cistern, or are generated therein. These agents are

the vapour of vinegar, carbonic acid, and oxygen gas. The vapour of vinegar may be formed by placing that fluid at the bottom of the cistern, or in separate vessels placed in it for that purpose, and heated by steam conducted through the vinegar, or in any other way by which a temperature of about 150 to 180 degrees Fah. may be sustained in the corroding cisterns. In my original specification, I described the mode in which the cistern, or vessel, containing the vinegar, might be replenished, and also other tubes and cocks which might be employed, but did not intend, and did not, in fact, claim them as parts of my exclusive right, as they may and will be used or omitted according as the other parts of the apparatus, or process, is modified. So far as the vinegar is concerned, it is manifest that my whole object is to expose the lead to the action of its vapour, produced by artificial heat, and this may be accomplished either by causing the heat to evaporate the vinegar within the cistern, or by placing it in a boiler or still without the corroding cistern, conducting it in by means of a pipe; or, instead of this, the boiler may be placed within the cistern, which may be provided with a feeding door to supply and regulate the fire, and tubes with cocks may also lead from and to the boiler to exhaust or supply it. Any practical engineer, or machinist, is competent to the making of such arrangements, and of adapting them to the purposes intended.

The quantity of carbonic acid necessary to be introduced within the corroding cistern is not great, and may be readily supplied from the fuel burnt to evaporate the vinegar. As, however, it is absolutely necessary for the success of my process to admit atmospheric air, for the sake of its oxygen, the quantity of carbonic acid required may be admitted at the same time. A gasometer, like those in gas works, may contain the atmospheric air, and a portion of that air which has passed through the fire may be allowed to commingle with it in the gasometer, being conducted into it from the escape, or smoke flue, through tubes properly fixed for that purpose, in the progress through which, it may be washed and purified if required. As no great quantity of carbonic acid is required, a work-shop, or laboratory, where there are fires, and a number of persons at work, will frequently contain the required amount; and where there is a deficiency, a small quantity of charcoal may be burnt, and its vapour conducted into the corroding cistern, or, circuitously, into a gasometer, should this method of supply be preferred. There are various other sources known to the chemist, from which the requisite supply of carbonic acid may be obtained; such, for instance, as limestone, chalk, and all the varieties of wood and coal. During the whole time the process is going on, that is, whilst the vapour of the acid, heated to the required degree, is operating upon the metallic lead, I supply the cistern, or apartment, freely with atmospheric air, which readily parts with its oxygen in the quantity required to oxygenate the metal. This supply may be given in the way indicated by means of a gasometer, or it may be forced in by bellows, or by other means. In some cases I have made suitable openings into the cistern, or apartment, and have

through them allowed of a spontaneous supply of atmospheric air and carbonic acid gas, without the use of any forcing apparatus.

I rest my claim to invention on the introduction, or admittance, of atmospheric air, or air containing oxygen gas, with the other agents or materials named; that is, the vapour of vinegar, and carbonic acid generated by the combustion of fuel, or disengaged from chalk or carbonate of lime, either pure or mixed with such irrelative matter as will not interfere with the process, in whatever way they may be generated, or produced, or by whatever means or apparatus their introduction, or admittance, may be effected, into cisterns or apartments, appropriately supplied with metallic lead, or with the metal required to be acted on.

EDWARD CLARK.

Specification of a patent for an improvement in the mode of manufacturing Spades. Granted to CHARLES RICHMOND *and* SAMUEL CASWELL, *jr., Taunton, Bristol county, Massachusetts, July,* 13, 1832.

To all whom it may concern, be it known, that we, Charles Richmond and Samuel Caswell, jr., of Taunton, Massachusetts, have invented an improvement in the manufacture of spades, which improved article we denominate the *Socket Spade*, and that the following is a full and exact description of our said invention.

A main object which we have had in view in the construction of these spades, was to form them so that they shall not be liable to clog, or suffer any resistance when in use, like the "back strap shovel," or any of those on the backs of which straps are rivetted, or other projecting part allowed, for the purpose of attaching the handle. Our mode of manufacture is applicable to spades and shovels of various kinds, and in an especial degree to those with blades of cast steel.

We make a socket of sufficient length to receive and securely retain the handle: on the lower end of this socket, we form a flanch with sufficient bearing to enable us to rivet it firmly on the front of the blade. In order to form a proper tread for the foot in using the spade, we sometimes turn over, towards the front, a sufficient portion of the upper end of the blade, removing so much of the middle part of this ledge, as might interfere with the attaching of the socket, by means of the flanch. Instead of so turning over the edge of the blade, we sometimes lengthen out the flanch, so that its upper edge shall extend along the whole width of the blade, from side to side, attaching it thereto by a sufficient number of rivets.

What we claim as new, and as our invention, is the making of spades and shovels with a socket to receive the handle; which socket is attached to the blade on the front side thereof, as above described, so that there shall be no strap, or other projection, on the back part thereof.

It is manifest that instead of forming a perfect socket, straps, em-

bracing a portion of the handle only, may be continued up from the flanch, and receive the handle in the ordinary way; but this mode of procedure, whilst it would be inferior to the socket, would still be an invasion of one of the essential parts of our right, the securing of the apparatus to receive the handle to the front of the blade only.

CHARLES RICHMOND,
SAMUEL CASWELL, jr.

Specification of a patent for an improved washing machine. Granted to ISAAC S. WRIGHT, *Weedsport, Cayuga county, New York, July* 18, 1832.

To all whom it may concern, be it known, that I, Isaac S. Wright, of Weedsport, Cayuga county, New York, have invented an improved washing machine, and that the following is a full and exact description thereof.

I prepare two, three, or more rollers, usually from four to five inches long, and from one and a half to two inches in diameter, and reeded, or fluted, from end to end. These rollers I fix within a suitable frame, or box, sufficiently long to admit the rollers to be arranged with their axes parallel to each other, and to revolve without coming in contact. Through this frame, or box, I pass wires, upon which the rollers revolve freely; or, otherwise, I fix wires in each end of the rollers, so as to form gudgeons, which run in metal, or other bearings, in the frame, or box. I, however, prefer the former method of allowing the rollers to revolve upon the wires, as being the most durable. The wires, or gudgeons, are placed near to the edge of the box, or frame, that the rollers may project from it at least one-third of their diameter. Across the back of this box, or frame, I affix a piece of wood, a strap, or other contrivance, to serve as a handle when the rollers are used.

When this apparatus is employed for washing, a smooth board is taken, which is made in the form of the well known fluted washing board, and is placed in the tub in the same way; but the clothes laid upon it are subjected to the action of the rollers, which are passed up and down over them, instead of being rubbed by hand, and in this way they are washed more rapidly, more effectually, and with less injury to the fabric than in any other.

Instead of using a washing tub, I sometimes cause a trough to be made of suitable length and width; it may, for example, be sixteen inches wide, and three feet long, and one foot high, more or less. Sloping boards may be permanently fixed at each end, enabling two persons to wash in it at the same time. To this trough I also sometimes attach a wringing apparatus, which is made by raising two standards above the trough, one from the middle of each side, with a cross piece at top to brace them firmly. A coarse bag, a strong net, or ropes, may be so fixed to these standards that by turning one end

by means of a winch, or handle, clothes placed within will be effectually wrung. I do not claim this apparatus as my invention, it having been so long in use as to have become public property; it is only mentioned with a view to point out the facility with which it may be used in conjunction with my washing rollers.

What I claim as my invention is the above described instrument, consisting of two or more rollers, fixed so as to revolve in a suitable box, or frame, which can be held in one hand, and the rollers passed over the articles to be washed, which articles rest upon a smooth board. The rollers, instead of being enclosed in a box, may be hung in a light iron, or other frame, merely sufficient to sustain the rollers and handle in their proper positions; but I claim all such modes of fixing them by which they are so arranged as to operate upon the principle above described.

ISAAC S. WRIGHT.

Specification of a patent for Saving a great part of the water usually expended in the passing of boats through the locks of canals. Granted to JACOB DEWEES, *M. D., Pottsville, Schuylkill county, Pennsylvania, December* 28, 1832.

To all whom it may concern, be it known, that I, Jacob Dewees, of the borough of Pottsville, in the county of Schuylkill, and state of Pennsylvania, have discovered a principle by the practical application of which the water which is usually expended in the passing of canal boats through the locks may be in part, or altogether, saved, and by which it is possible also actually to increase the quantity of water in the upper level by transferring thereto a portion of that in the lower level, by the mere passing of the boat from one to the other; and the principle of which discovery may be also extended so as by a special set of locks to pass empty boats without the quantity of water which is required to fill the lock for those which are loaded; and I do hereby declare that the following is a full and exact description of the manner of constructing canals and their locks in such a way as shall attain the end proposed.

The canal and its locks should be constructed in the usual way, with this difference only, that the lift of the lock must be, in all cases, somewhat less than the depth of the canal, so that the water would, at the height at which it stands in the lower level, flow over and cover the bottom of the canal in the upper level. In the actual construction of canals this has sometimes happened to be the case, but as this has been merely accidental, and not adopted with a view to the application of the principle which I have discovered, it cannot be made in any way to interfere with any claim to the practical application of the principle on which my discovery is based. For the purpose of giving a clear exemplification of this principle, I shall refer to the diagram, or sectional view of a canal with its locks, which accompanies this specification, and makes a part thereof.

If the number of cubic feet of water which is admitted through the upper gate of a lock into the chamber for the purpose of raising the water therein from the lower to the upper level, be less than the number of cubic feet which the boat afterwards displaces by entering the chamber, it, of course, must throw back, through the upper gates as it enters, that excess which it displaces above that which was let in. Now that this may happen will appear by supposing A, fig. 1, to be the gates of the upper, and B the gates of the lower level, the dotted line C, to represent the surface of the water in the lower chamber when the lower gate is open and the upper gate shut; D, the surface of the water in the upper level, or which is the same thing, that in the chamber.

When the upper gate is open and the lower gate shut, let E represent the submersed hull of a boat, in the upper level which is about to enter the chamber, and to be let down into the lower level. When the wicket gate of A is opened, a quantity of water will pass into the chamber, which may be represented by the dotted lines C and D; now let the boat, E, enter, the hull of which, whilst in the upper level, was submersed below the water line C, of the lower level, and it is plain that if the boat was to fit the whole capacity of the chamber between its sides and the gates, it would force back into the upper, a portion of the water which originally stood in the lower level, equal to that before alluded to between C and D. But as in practice there must be some play allowed to the boat in all directions, a corresponding deduction must be made from the quantity, which however does not in any way militate against the principle: should the boat do no more than displace the actual quantity admitted from the upper level, it will still save all the water which is usually lost in the lowering of the boat.

The application of the above described principle may be still further extended to canals ascending and descending to and from a summit level, where it is important that water should be saved. For this purpose, a set of locks must be constructed for the descending boat when empty. Such a provision derives its importance from the fact, that the produce of the country, which finds its way to market along our canals, is always greater in its amount of tonnage than the articles returned by the boats, many of which will consequently pass along without loading, or nearly so. An empty boat will require in its ascent its own weight of water only, but in descending it will always require the full chamber, less its own weight. Now suppose the lift of the ordinary locks in the canal to be four feet, and that forty tons of water be required to fill it to a height with the surface of the upper level of the canal, and that the empty boat to be passed weighs ten tons, it will necessarily displace its own weight in water only, and in its descent carry along with it thirty tons. By the construction of two chambers of two feet lift each, beside the one of four feet lift, the chamber of two feet lift requiring but twenty tons of water to fill it, and the boat displacing ten tons, consequently would carry but ten tons of water with it in its descent—hence there will be

a gain, compared with the four feet lift, of twenty tons for the use of the canal.

By constructing three chambers, with a lift of sixten inches each, in place of the two of two feet each, the saving may be extended still further.

A canal, with a view to meet the foregoing principle, applied to the locks, may be excavated in such a manner as to save great expense, and very much enlarge the facilties of the trade; the side of the canal wherein is situated the lock for the passage of the heavy boat, will only require to have a channel to the greatest depth of the canal, of barely sufficient width for its passage. The side wherein are the locks for the empty boat, will only require such depth of water as will pass the empty boat, which will also be of sufficient depth to admit of the escape of the water displaced by the loaded boat, and give an increased width to the canal. Provision must be made for the passing of loaded boats at convenient and proper distances in the shoal side. There should be tow paths on each side of the canal, which will also avoid much detention.

What I claim as my invention, and for which I ask a patent, is the application of the principle herein before set forth; that is to say, the construction of canals to save the excavation, in part; in which the lift of each lock is less than that of the depth of the water in the canal, for the purpose of saving water in the passing of boats through the locks; and I do further claim the extending the same principle in the construction of locks of a less lift than those used for the passing of loaded boats, which are to be constructed along side of, or near to, the ordinary lock; the combined lift of two, three or more special locks, being equal to that of the general lock, or locks.

JACOB DEWEES.

References to the Plate.

Fig. 1.

A, upper lock gates.
B, lower gates.
C, height of water in lower level.
D, height of water in upper level.
E, canal boat.

Fig. 2.

F, chamber for loaded boats.
G G, chambers for empty boats.
H H, towing paths.
I, wall between locks.
J, deep part of upper level.
K, shoal part.
L, turn out in shoal part.

Remarks by the Patentee.

In canals where there is a sufficient supply of water, but no more, the principles of the *water saving canal* may, in some parts of them,

be so applied as to admit of the employment for manufacturing purposes, of that water which is lost in passing boats through locks of the ordinary construction. To derive all the advantage from the principle of which it is susceptible, there must be a uniformity in the tonnage of the boats generally traversing the canal; and, in this case, they may be passed not only without the expenditure of any water, but may actually be made to throw from one ton to half the weight of the boat, and even more, into the upper level. I am well aware that, in practice, it is necessary to allow to the boat a considerable play in the locks, for the free passage of water around it, and that the quantity which might otherwise be thrown back, will consequently be lessened; but after making due allowance for this, there may still be a gain beyond the amount of what will be required for the ascending tonnage.

Great expense and loss are frequently caused by the necessity of taking the water from mills in the courses of new canals; by my plan this would be in many instances rendered unnecessary. In crossing summits also much will be gained; the quantity of water required for a canal on the present mode of constructing them prevents their being carried near to the sources of streams, the supply being insufficient; but by adopting my improvements, the distance from the stream on one side of a summit, to that on the other, will be much lessened, and what is still more important, the height to be ascended in overcoming its elevation, will be proportionately decreased.

The greater the depth of the canal, and the heavier the tonnage of the boat, the greater will be the facilities offered in the passage of a boat upon my principle, as the quantity of water forced up will be more than proportionately increased. Suppose a canal to be six feet deep, and the boats used on it to be of one hundred tons burden, and suppose the water at the summit to be no more than will suffice to fill the canal, to compensate for evaporation and leakage, and to supply one half of that required by the estimated trade; it is manifest that upon the common construction no more could be carried on; but by using boats of 100 tons, they might be made to supply all the water that the whole trade would require, although this could not be effected by those of twenty, thirty, or forty tons.

Canals having their courses along side of rivers, like the Potomac, Schuylkill, Lehigh, &c. where the productions of the country are greater than can be transmitted by them, may be so altered as to carry boats of heavier tonnage, and yet require less water: the only limit to the trade will then be in the number of boats which can pass in a given time. In making an estimate of the probable tonnage on a canal, it will not, on my plan, be absolutely necessary to take into view the necessity of obtaining water from extra reservoirs, to supply a scarcity.

J. DEWEES.

Daures' Improvement in Canals

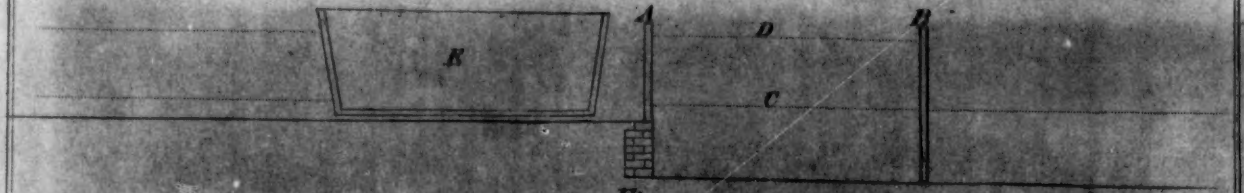


Fig. 1.

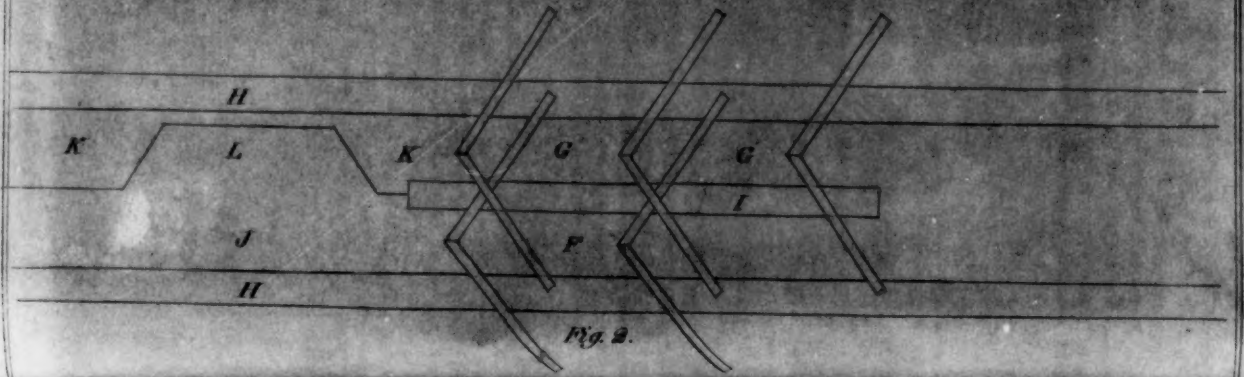
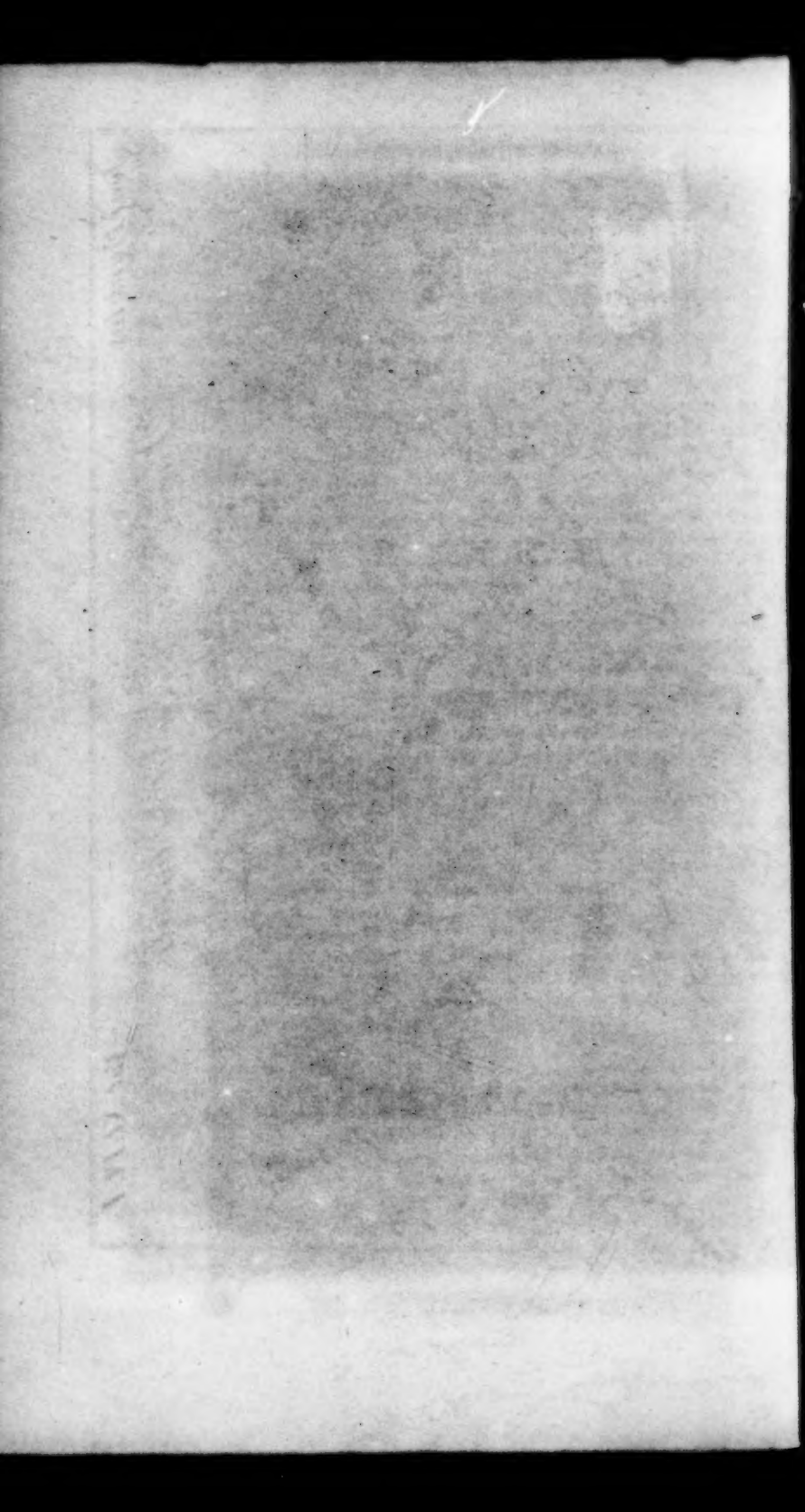


Fig. 2.



ENGLISH PATENTS.

Patent granted to Arthur Howe Holdsworth, *Esq. for his having invented improvements in the construction of rudders, and in the application of the same to certain descriptions of ships or vessels. Sealed November* 19, 1831.

This invention consists in so constructing and applying the rudders to ships, or vessels, that they may revolve completely round upon the axle by which they are attached to the vessel, in order that, in whatever direction the vessel may move, the rudder may be readily brought to a proper bearing in the water. The patentee considers that by this contrivance greater facility will be obtained in steering, while such rudders so applied will be less liable to be carried away when struck by a sea, or from the ship suddenly making sternway, in consequence of the rudders so applied to the ships or vessels being enabled to make a whole revolution on their axis.

It is to be observed that the invention applies only to those descriptions of ships which have a single stern and sternpost, but does not apply to double, or twin-bodied boats which have rudders placed between them.

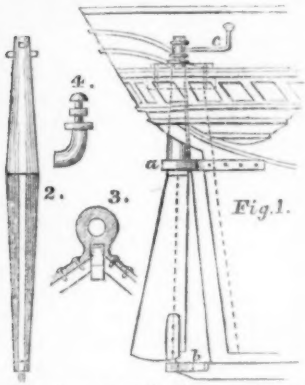


Fig. 1.

Fig. 1 represents the stern of a vessel, having the improvements applied thereto; fig. 2, is an edge view of the rudder detached. The axis of the rudder must be carried out from the lower part of the stern post, and stand perpendicularly, as shown in the figure. It is to be supported at top by a strap and collar, as represented in the detached figure 2, which strap is made fast to the transom, or to the stern frame, as near the hance as conveniently may be, and through the collar the upper part of the rudder passes, and turns in it at *a*. The lower end of the rudder is supported on an elongated part or continuation of the keel at *b*, where a metal gudgeon is fixed to receive it. The object of so mounting the rudder at a distance from the stern post is to enable it to turn completely round, without coming in contact with the stern post.

It will be seen that this rudder is without the usual pintles, and the front, or bearded part, is cut to a ridge shape; it will also be seen that in order to apply the improvements, the stern post of the vessel must be made to stand at such an angle to the axis of the rudder as will afford space sufficient for the rudder to make a complete revolution on its axis.

This rudder may be actuated by a tiller *c*, and tiller ropes; in which case there should be a strong pin in the end of the tiller farthest from the rudder; or the end of the tiller may be turned up, as shown by the enlarged fig. 3. Upon this turned up part of the tiller a swivel should be placed, having two eyes, to which the tiller ropes are attached or the rudder may be actuated by means of a pinion affixed on an upright shaft working into a horizontal toothed wheel affixed on the head of the rudder, such upright shaft having a horizontal steering wheel in the usual way, or it may be worked by any other of the usual combinations of mechanism employed for steering, care being taken that whatever mode be adopted, whether by tiller or otherwise, a whole revolution can be made by it.

In steering a vessel which has these improvements in the construction and fixing of the rudder applied, it will be necessary in the event of its being desired, that the ship should make stern way, for the man at the helm immediately to let go the wheel or steering apparatus, and on the ship moving by the stern, the rudder would revolve upon its axis and turn into the space left between the stern post and the axis, and be in a line with the keel: when the helmsman will again take hold of the tiller or wheel, and would be enabled to cause the rudder to take any angle with the keel consistent with the new course of the ship; and when she was required again to make headway, the helmsman would permit the rudder to revolve into the position shown at fig. 1.

The specification concludes by saying, "Having described the nature of my invention, and the manner of performing the same, I would have it understood that I lay no claim to any of the parts of which the same is composed, but I claim the constructing and applying rudders to ships or vessels in such manner that they may revolve on their axis, and thus in whatever direction a ship or vessel may move, their rudders will always present their proper edges or bearings to the water, as above described." [*Lond. Jour.*

Patent granted to AUGUSTUS APPLEGARTH, *printer, for his having invented certain improvements in printing machines. Sealed August* 31, 1830.

This invention applies to the printing of calicoes, silks, and other goods of that kind, and also paper for hangings, and consists in a peculiar mode of adapting engraved plates to a machine, for printing patterns or devices on those sorts of goods.

The improvements proposed may be considered under two heads; first, the peculiar method of constructing and applying these engraved plates to a printing machine; and secondly, the means by which such plates may be advantageously worked in a printing machine.

The designs, patterns, or subjects intended to be printed, are, in the first place, to be engraved upon thin copper plates, in the way

that art is usually practised for calico and silk printings. The plate is described as being equal in length to that of the bed roller of the machine, which corresponds with the width of the calico, or silk, to be printed, and the width of the plate may be equal to any portion of the pattern.

The plate, when engraved, is to be bent into the form of a segment of a cylinder, by pressing it upon the surface of a mandril, or metal roller; it is proposed to do this by passing it through the machine, by bearing it against the face of the plate, with a wooden block or stout board.

Upon the metal cylinder in the machine, called the bed roller, a segment block is to be fixed, by screws or otherwise, the surface of the block being concentric with the axis of the roller, but raised a few inches from its periphery, and extending so far round the roller, as shall be equal to the breadth or extent of the portion of the pattern engraved upon the plate. Upon this block the bent plate is to be secured by turning its edges over the sides of the block, and passing screws or pins through it into the block to hold it fast.

The material, whether silk, calico, or other goods, intended to be printed, is to be conducted in an endless length between the face of this plate on the bed roller, and the periphery of the press roller; the force of which causes the impression to be taken in the ordinary way upon the calico, silk, or other fabric, as it passes through, when the machine is put in operation: the inking of the plate, that is, supplying it with colour, being effected by a ductor and scraper as usual. It is further to be observed, that two of these segment plates may be employed at the same time, affixed to rollers, the one below, and the other above the press roller, which will afford the means of printing two distinct parts of the pattern by the same movement of the machine.

When one impression has been given, the calico, or silk, must be shifted forward, while the plate is receiving a fresh supply of colour for the next impression: observing, that the machine is to be furnished with stops, in order to arrest the progress of the calico or silk, exactly at those points which shall bring the parts of the pattern last printed, to coincide, or join correctly, with the corresponding parts of the pattern about to be printed by the next movement.

These parts, however, are common to machines employed for printing by rotary cylinders, and so are the general arrangements of the printing press, the only feature of novelty herein claimed, being the employment of a curved plate, fixed upon a segment block on the surface of a roller for printing calicoes, silks, paper hangings, or other similar kinds of articles.

An engraved plate of this construction may be employed, extending only part of the way across the machine, that is capable of printing a portion as half, or a quarter only, of the breadth of the calico, or silk, at one impression, and which of course will require to be shifted laterally to give the pattern over the whole breadth of the piece.

This is proposed to be done by mounting both the printing and pressing rollers in a frame, which shall be capable of sliding sideways.

The plate, as before described, is bent to the form of a segment of a cylinder, and mounted upon a segment block, upon the bed roller, but only extending part of the length of the roller. The frame that carries these rollers is considerably wider than the breadth of the calico or silk which passes through it, to be printed, and a projection from the frame at one end is acted upon by a rotary cam, which moves round as the rollers in the machine work. This cam is formed like a hoop or drum, with steps or inequalities in its edge or rim. Whilst the first portion of the pattern is printing, a flat part of the edge of the drum acts against the frame, but immediately afterwards an inclined plane on the edge of the drum comes opposite to the end of the frame, and allows it to move sideways, the frame being drawn tight against the cam by a weighted cord. By the time that the plate has come round again to give a second impression, the frame with the rollers has moved so far in a lateral direction as to bring the plate opposite the blank part of the piece of calico, or silk, close to the side of the former impression; the print is then given, and the two portions of the pattern perfectly join, or correspond, if the steps of the cam have been correctly made.

It is scarcely necessary to add that the number of steps on the edge of the hoop cam will depend upon the length of the plate, and the number of movements necessary to carry it across the entire breadth of the piece of calico or silk under operation.

The patentee states in conclusion, "First, I do not claim the use of any kind of circular shaped block, or plate, for printing, made by casting, hammering, turning, or by any other means than those described: secondly, I claim the divided curved plate, or the division of a curved plate for printing, either across or along the goods, by several successive operations, by whatever machinery it may be employed. [*Ibid.*

Patent granted to WILLIAM PALMER, *gentleman, for his having invented certain improvements in making candles. Sealed August* 10, 1830.

The object proposed by the patentee is, to produce tallow candles which shall not require snuffing; that is, the wicks of which shall be completely consumed in the combustion of the other materials of which the candle is made.

There are two particular points in this invention; the first is, the combination of a chemical material with the matters composing the candles; and the second is, a peculiar mode of forming the wicks.

The chemical material employed is bismuth, in a finely divided state, which may be either made to adhere to the wick, or be mixed with the tallow, so as, in either case, to burn with the candle.

The bismuth, which may be sub-nitrate, or any other preparation, is to be pounded, and finely granulated, and when that is done, it must be ground up with oil in the same way that colours are usually prepared. This material is to be applied to the threads, or yarns, of

cotton intended to form the wick, by means of a brush, which must be done by daubing, rather than painting, and the cotton will be found to absorb the oil, while the bismuth will adhere to the external fibres of the thread.

In constructing the wicks, about one-tenth of the whole quantity of cotton required, must be taken from the threads, or yarns, prepared with the bismuth; these being placed with the other nine-tenths of ordinary yarns, are to be enclosed by them, and bound round in the manner called gimping. When so prepared, the wick yarn will have acquired a slight degree of stiffness, and having cut the yarn into pieces, equal to about twice the length of the intended candles, these pieces of yarn are to be severally twisted double round a rod or wire, the lower end of the rod having a notch at the bottom, into which the yarn passed, for the purpose of preventing its slipping. The yarn thus twisted round the wire, or rod, in a double coil, resembling the *Caduceus of Mercury*, is with its rod to be inserted in the candle mould, and when the tallow in the mould has become set, or hard, the rod may be drawn out at top, leaving the wick in the candle in the double coiled form described.

The same form of double coiled wick, prepared as above, may be used for dip candles also, as well as moulds, by passing a rod through the eyes, or loops, at top of the wires, and dipping the wicks into the tallow vat in the ordinary way of making dip candles.

The advantage of this improved candle is, that as the tallow becomes consumed, the ends of the double wick will stand out sideways on each side of the flame, and the bismuth attached to the wick being acted upon by the oxygen of the atmosphere, will cause the wick to be completely consumed by the combustion, and therefore not require to be snuffed. The same effect will take place, though not so perfectly, in a single wick prepared with the bismuth, and if any superfluous quantity of bismuth should hang in globules about the wick, it will very soon be dissipated by evaporation.

An approximation to the same effect may be obtained by mixing granulated bismuth with the tallow in the proportion of about one drachm of bismuth to one pound of tallow. In candles made of this compound, when burning, the bismuth will deposit itself upon the wick, and cause its complete destruction by combustion, and require no snuffing, as above said. [*Ibid.*

Patent granted to GEO. G. BOMPAS, *M. D., for an improved method of preserving copper and other metals from corrosion. November* 4, 1830.

It having been discovered that the oxydation of metals is effected by an electric or galvanic operation continually going on between the metal and water to which it may happen to be exposed; the patentee proposes to neutralize that galvanic action, by connecting to such metal as may be in a negative state, such a quantity of another

metal, which is in a positive state, as respects the electric or galvanic circuit, as will neutralize its action.

The metals proposed to be employed, are an alloy of zinc and tin, in various proportions, according to the state of the metal to be protected, copper, iron, or lead, and according to the state of the water to which they may be exposed, whether soft, or fresh. These proportions are to be obtained by experiment; and an instrument which is capable of showing the intensity of the galvanic action, is to be employed. These alloys are to be attached to the sheathing of ships, to tanks, and cisterns holding water, and in every situation where oxydation is to be prevented; which may be done by the neutralization of the galvanic or electric action.

We do not perceive in what particulars this invention differs from that which formed the subject of a patent granted to G. Pattison, Esq. for a means of protecting the iron sheathing of ships, boats, spikes, braces, and chains, from oxydation; (see Journal Franklin Institute, vol. iv. p. 94.) [*Ibid.*

List of French Patents.

A List of Patents for inventions and Improvements, and the introduction of Foreign Inventions and Improvements, granted in France during the fourth quarter of the year 1831.*†

[TRANSLATED FOR THIS JOURNAL.]

Edward Baccuel, Paris, December 12th, (5 years.) A mechanical counter, intended to show the number of passengers who may have entered a public stage. (P. Improv.)

Archilles de Bernardiere, merchant, Paris, October 10th, (five years.) Manufacture of compound pasteboard paper, imitating Chinese paper, and paper to be used in engraving, in lithography, in drawing, for oil painting, for paper hangings, and for ladies' bonnets. (P. Improv.)

Michael Boche, manufacturer of powder flasks for loading and priming; Paris, October 10th, (5 years.) A powder flask giving the quantity of powder necessary to form a charge. (P. Improv.)

John Boivin, mechanician at St. Etienne; November 7th, (5 years.) A process for manufacturing gun barrels under the roller. (P. Improv.)

Philip Augustus Brion, architect, Paris, December 5th, (10 years.)

* The Committee of Publication have made an arrangement by which they hope to present, in future, a regular list of French patents, and also to complete the list from 1828, the date of the last list published in this Journal, to the date now given. It is known, probably, to most of our readers that the specifications of patents, in France, are not published without the request, or permission, of the patentees, until the expiration of the time for which the right was granted. COM. PUB.

† P. I. denotes a patent for inventing,—P. Improv., a patent for improving,—P. Import. a patent for importing, or introducing a foreign invention.

A new system of muskets, pistols, and arquebuses, firing from one to four and more shots. (P. I)

Stephen Chaix, Paris, October 10th, (5 years.) New arched and flat roofs for buildings. (P. I.)

Dumont Claudot, architect, Paris, November 28th, (15 years.) A method of turning off water. (P. I.)

Francis Colancon, Nismes, December 31st, (5 years.) A dyeing composition, entitled "virgin powder." (P. I.)

John Benjamin Coquatrix, suspender manufacturer, Roan, October 22nd, (10 years.) A mechanism to take the place of steam. (P. I.)

John Edward Conmeadon, John Osborn, and Samuel Dalton, all residents of Paris, November 21st, (5 years.) A composition, by them called antiglutinous, or grease which does not melt when exposed to heat, and suitable for greasing wheels of carriages, mills, and the rubbing parts of all machines. (P. I.)

Lewis Augustin Crosnier and Alexis Sauvage, Paris, October 14th, (10 years.) A new fire engine, double acting, and with a rotary motion. (P. I.)

Philibert Damiron, founder, Lyons, October 22nd, (15 years.) A process for cleansing, doubling, and twisting silk and other filamentous substances. (P. I.)

John Baptiste Mathieu Danloy, buckle and thimble manufacturer, residing at Raucourt, Department of Ardennes, December 31st, (5 years.) Tinning of steel and iron sewing thimbles. (P. I.)

Peter Francis Delacroix, manufacturer of chemical products, Roan, December 20th (10 years.) A chimney apparatus, which he calls a *multiplier*, intended to distribute heat in contiguous and upper apartments. (P. Improv.)

Nicholas Desmonds, worker in wood, Paris, December 31st, (5 years.) A wooden stuff, which he calls Scotch Carmentine, fit for different fancy articles. (P. I.)

Francis Jules Devinck, chocolate maker, Paris, November 2nd, (5 years.) An apparatus for roasting coffee and cocoa by means of steam. (P. I.)

Henry Lambert Dretzen, harp manufacturer, Paris, October 17th, (5 years.) A *double* mechanism adapted to the harp, to regulate the tension of the strings for every tone; and a *single* mechanism regulating the semi-tones of the medium high notes. (P. I.)

Duverger, printer, Paris, October 22nd, (15 years.) A process for printing music with moveable types, and in relievo, which he calls Stereomelotypy. (P. Improv.)

Nicholas Fonzi, dentist, Paris, a grantee of Ange Joseph Fonzi, December 7th, (10 years.) Apparatus of cast iron, or of any other material intended to burn coal in the open air, and free from either smell or smoke. (P. Improv. and Import.)

James Anthony Frigerio, apothecary, Paris, November 21st, (5 years.) A disinfecting apparatus. (P. I.)

Lewis Gauthier Delatouche, Paris, October 24th, (15 years.) A

folding iron bed, with an elastic back, forming mattress and bolster. (P. I.)

Lewis Gauthier Delatouche, Paris, October 5th, (15 years.) A folding iron bed, with an elastic back, forming mattress and bolster. (P. Improv.)

Augustus Girardet, mechanician, St. Etienne, October 22nd, (5 years.) A process for manufacturing gun barrels under the roller. (P. I.)

Peter Grandin, dyer, December 31st, (15 years.) A machine for extracting the colouring matter of silks, cottons, and wool, either raw or manufactured, coming from the dyeing vat. (P. I.)

Francis Anthony Henry, mechanical engineer, Paris, November 2nd, (5 years.) A fourteen shot musket. (P. I.)

Victor Houyau, manufacturer, December 20th, (10 years.) A steam boiler, which he calls a vertical cylindrical boiler, with horizontal tubes. (P. I.)

Claudius Jaillet, Lyons, October 10th, (15 years.) A machine for manufacturing all sorts of figured stuffs. (P. Improv.)

Paul Janson, Paris, October 17th, (10 years.) Process for reviving, and manufacturing, discolouring charcoal. (P. I.)

Benigne Joanne, Paris, November 2nd, (10 years.) Process for gilding and enamelling silver trinkets. (P. I. Improv.)

John Baptiste Benjamin, Paris, December 5th, (5 years.) A machine for warming carriages in winter, and preserving them from dust in summer. (P. Improv.)

Francis Xavier Laverriere, maker of weaving combs, Lyons, December 20th, (5 years.) A method of soldering weaving combs by tin; and a new sort of comb. (P. I.)

Edward Lesquin, merchant, Brest, December 31st, (5 years.) Construction of standing rigging, moorings, and crane scapements of iron wire. (P. I.)

Maness Mallet & Co., nail makers, Valenciennes, December 31st, (10 years.) A method of making nails with flat or round iron, without waste of material. (P. I.)

Samuel Morand, represented at Paris by M. Truffaut, November 21, (15 years.) A machine for restoring the original width of woven and other stuffs, when they have lost it by washing, dyeing, or printing. (P. I. Import. Improv.)

James Eloi Meunier, teacher at Vitry le Francais, department of Marne, December 31st, (5 years.) Mechanical plough. (P. I.)

Julius Pamparé, gilder on glass, October 24th, (5 years.) Method of applying gold, silver, and other coloured ornaments on every sort of varnished wood, on painted and varnished cloth, and waxed calico. (P. I.)

James Perry, of London, represented at Paris by Mr. Perpigna, December 20th, (10 years.) A metallic pen, which he calls Perryan pen. (P. Import. Improv.)

Arnoux Rivière, of Nantes, and Braithewaite, of London, represented at Paris by Mr. Callaghan, banker, December 20th, (10 years.)

A method of manufacturing and crystallizing salts. (P. Import. Improv.)

Camillus, Count of Rochefort, captain in the second regiment of dragoons, Paris, December 31st, (15 years.) A new and complete horse harness. (P. I. Improv.)

Lewis Roth, Paris, December 20th, (15 years.) An apparatus and method of evaporating and boiling sirops without injuring them. (P. Improv.)

Joseph Cesar Salarie, Nimes, October 17th, (5 years.) An agricultural instrument, which he calls amputator. (P. I.)

Anthony Salmer, surgical instrument maker, Paris, November 14th, (5 years.) Catheters of different shapes, of gum elastic. (P. I. Improv.)

Andrew Paul, Augustus Sautereau, Paris, December 12th, (5 years.) An apparatus for manufacturing oil gas, with a regulator. (P. I.)

Nicholas Seblumberger & Co., manufacturers, Guebwiller, Department of the Upper Rhine, December 26th, (5 years.) A carding and picking machine for cotton, which winds it on the bobbins in mashes fit for fine spinning. (P. I.)

Armand Peter Seguier, counsellor at the royal court, Paris, December 12th, (10 years.) A new steam apparatus peculiarly applicable to navigation. (P. I.)

Anthony Dominick Sisco, mechanician, Paris, December 5th, (5 years.) An instrument containing all the tools necessary for mounting and taking to pieces fire arms. (P. Improv.)

Mary Dorothy Bathilde Soulante, Paris, December 5th, (15 years.) A steam engine called a rarifying boiler pump, adapted to navigation. (P. I.)

Francis Vital Marten Terrasson de Fougeres, residing at Teil, Department of Ardeche, December 31st, (5 years.) Manufacturing of bricks and tiles by mechanical processes. (P. Improv.)

John Elias Vignaux, contractor for military accoutrements, Paris, December 5th, (10 years.) Shoes, or sandals, made of impermeable leather, varnished and seamless. (P. I.)

Recapitulation.—During the fourth quarter of 1831, were issued 49 patents.

¶ TRANSLATIONS FROM FOREIGN JOURNALS.

Action of Plaster as a Manure.

[Translated for this Journal.*]

It is well known that plaster, or sulphate of lime (gypsum) has been used for a long time in agriculture, as a manure for soils, particularly for those of artificial meadows. Fourcroy was the first to suggest that this substance probably acted as a stimulant exciting ve-

* By request of the Committee on Publications.

getation, and this opinion has been generally adopted. Other persons, however, have supposed that the plaster owed its power to the water which it absorbs, and which they supposed it to give up to the plant in times of drought.

M. Becquerel lately communicated to the Academy of Sciences an account of some experiments of M. Peschier, of Geneva, which throw much light upon this subject, and prove the correctness of Fourcroy's opinion. M. P. sowed in vases filled with slightly moistened sand, seeds of the water cress. He watered some of these seeds with pure water, and others with water impregnated with sulphate of lime. When the plants had attained the height of about four inches, they were burnt, and an equal quantity of the ashes of each submitted to analysis; and it was always found that the plants which had been watered with the solution of sulphate of lime, contained a quantity of sulphate of potassa, one-half greater than those to which the pure water had been applied.

In a second set of experiments M. P. caused a powerful current of electricity to pass through plants watered with sulphate of lime, and he found that it always increased the quantity of sulphate of potassa in the plants, and caused a more vigorous vegetation. The sulphate of lime is thus shown to be a powerful stimulant for certain plants; it is decomposed in the process of vegetation, and its sulphuric acid combines with potassa to form a sulphate of potassa, which thus enters in greater proportion than it would otherwise (i. e. if the sulphate of lime were not applied,) into the structure of the plant. M. P. considers that crude plaster is preferable, as a manure, to that which has been calcined.

[*Academy of Sciences of Paris, Nov. 7th.*

Process for Making Vinegar.

Much attention has, within a few years past, been paid to improving the process of vinegar making, the object having been to abridge the time consumed in the operation. The following apparatus, modified by M. Tier from the apparatus of M. Leuchs, has been extensively used. It consists of a cask of oak six or seven feet high, (see the cut,) the upper head being three and a half feet, and the lower three feet in diameter. The cask is hooped with iron, and has, about one foot from the bottom, eight holes, *a a a*, &c. bored in it, each hole being about two-thirds of an inch in diameter. Below these is an opening from which a pipe *b* passes to a vessel, *c*, placed near the cask. In the upper part of the cask is placed a slightly conical recipient, six inches high, and having a moveable bottom *d d* pierced with holes. Into four of these, glass tubes, *e e*, are sealed, projecting three inches above the bottom. A thermometer passes through this bottom into the space, *g g*, below.

This division of the cask is filled with fine shavings of beech wood, which should be well washed, and thoroughly impregnated with strong and warm vinegar; the shavings should be loose, and fill the space to within about one inch of *d d*. A small string passes through each hole in *d d*, being kept from slipping through by a knot above, and hanging so as nearly to touch the shavings. The top of the cask has a cover, through which passes a wooden tube. Connected with this tube is a second, which is carried through a refrigerating tub to condense the acid vapours which rise into it. Two buckets, used alternately, are placed above the cask, and the materials for making the vinegar being up in one of these are suffered to flow gradually into the wooden tube, and thus into the space between the tops *f f* and *d d*. The strings passing through the holes *d d* deliver the liquid in drops, upon the shavings, by which it is exposed, with an increased surface, to the oxygen of the air admitted through the holes *a*, *a*, &c. The mixture used is brandy forty parts, vinegar seventy-five parts, water 125 parts, to which, if practicable, should be added seventy-five parts of beer, (biere blanche,) heated to 144 degrees Fah. The room in which the process goes on should be heated to about 100° or 110° Fah. The mixture requires to be drawn off, and repassed once or twice through the shavings, in order to give a strong vinegar: when this is done, the brandy should be added in separate portions. By this process, in twenty-four hours, vinegar may be made, two ounces of which will neutralize 100 grains of crystallized carbonate of soda.

[*Mémorial Encyclopédique quoting Jour. für Techn. Chem.*

Action of Oils on Oxygen Gas.

M. H. De Saussure gives the following results, from his experiments on the action of oils upon air, at ordinary temperatures. The fixed oils when recently prepared, have little or no action upon oxygen gas, absorbing but a very small quantity of it. This small quantity of oxygen seems, at first, not to modify their properties, but in time it produces a change in them, by which they are enabled to absorb a much greater quantity of the gas, and are dried or rendered rancid, according to the nature of the oil. This interval of inaction is shortened, or even destroyed, by the processes of oxidation, which are practised in the arts. The drying oils differ from others in the greater quantity and rapidity of the absorption of oxygen. If the oils be further exposed to oxygen they produce carbonic acid and hydrogen, the drying oils producing less carbonic acid, in proportion to the oxygen absorbed, than others. Volatile vegetable oils resemble the fixed drying oils in their action upon oxygen, and produce but little carbonic acid and hydrogen, until they have absorbed a considerable quantity of oxygen. The absorption of oxygen removes the colour of fixed oils, and colours the volatile oils. The action of naptha upon oxygen is very feeble.

[*Ibid, quoting Mem. Soc. Hist. Nat. Genève, tome V. and Bibl. Univ.*

Essence of Roses.

It is said that the East Indian otto of roses is obtained by placing in a suitable vessel, alternate strata of rose leaves, and of the seed of a kind of digitalis, which is rich in oil. The oil of the seeds absorbs the oil of roses, and both being expressed, they may be separated by distillation with water.

[*Berzelius, vol. 5.*

Composition of Minium, (Red Lead.)

M. Dumas has given a detailed examination of the composition of this substance. Preparing it from the same massicot, (protoxide of lead,) he found that the quantities of oxygen absorbed, after heating at intervals of twenty-four hours, in the reverberatory furnace used for the preparation of this compound, were as follows,—

100 parts of minium had absorbed after	1	heating	1.17
"	2	do.	1.22
"	3	do.	1.36
"	4	do.	1.50
"	5	do.	1.55
"	8	do.	1.75

Ceruse absorbed oxygen more rapidly than massicot, and after three heatings the orange oxide yielded in 100 parts 2.23 of oxygen by its conversion into the protoxide.

[*Annales de Chim. et Phys.*

Tablets to be written upon with a slate pencil.

The following receipt is given by M. K. Braconnot, for making these tablets in imitation of those brought from Germany.

Silicious sand in an impalpable powder	82 parts
Lamp black	8 ,,
Boiled linseed oil	10 ,,

Grind these substances well, mix them, and add oil of turpentine. Spread the mixture with a brush upon smooth paste board. [*Ibid.*

Note on Hardening Steel.

White cast iron, which could not be worked with an English file, was drilled with tools hardened in the following manner. The end of a gun barred was filled with the fusible alloy of d'Arcet, (composed of eight parts of bismuth, five of lead, and three of tin,) which melts at 212 degrees Fah. The tools being introduced into the barrel, the mouth was closed by an iron stopper, and the whole heated to a white

heat, and then suddenly dipped into cold water. The stopper being removed, and the barrel put into boiling water, the alloy melted, and the tools were removed.

With two of these tools sixty-three holes were drilled in the bottom of a cast iron furnace, about a quarter of an inch thick.

[*Jour. des Connais Usuelles.*

Method of removing spots from mildewed stuffs.

Add to two pounds of water two ounces of volatile alkali, (ammonia.) Plunge the entire stuff into this solution, and allow it to remain there five minutes. Rince in clean water. [*Ibid.*

Method of Cleansing Gilt Frames.

Gilt frames which are exposed to the dust of the rooms in which they are hung, generally collect it on the moulding. Gilders on wood, to cleanse these frames employ very weak soap suds, but if this is not used with the greatest care, and by experienced hands, the frame soon loses all its freshness. On this account, we give the following method, which is used by a distinguished workman, who has communicated it to us. Take three ounces of white of eggs, one ounce of jeweller's wash,* beat them together, and clean the frames with a soft brush dipped in this mixture. The gilding becomes immediately bright. This operation may be repeated several times successfully on the same gilding, which could hardly be accomplished by the old method. When the frame has been cleaned, it must have a new coat of the varnish which is used by gilders on wood. [*Ibid.*

India Ink.

Take half an ounce of lamp black, half an ounce of sulphate of iron, an ounce of gall-nuts, two ounces of clean gum arabic; pulverize the whole, and grind it for five minutes on a piece of marble, adding water until it becomes of the ordinary consistence of ink. This process, which is used in Persia to make India ink, makes a most beautiful and most lasting ink. [*Ibid.*

A Composition to mend Glass, China, and Delft Ware.

We have been often consulted in relation to a powder which is sold in a shop at the Palais Royal, and which is brought from Eng-

* Eaude javelle, chloride of potassa, or soda.

land. This powder has a justly merited reputation, and all the articles which have been mended with the cement which it forms are as solid as before they were broken. The adhesiveness of this preparation is so great, that cabinet makers use it to fix the veneerign on furniture, where metal is used, and for which purpose common glue would not answer.

After numerous experiments, we have found a composition which has all the properties of the English preparation, and is, perhaps, with some variation in the proportions, the true recipe. Take one-half pound of curdled skimmed milk, wash it until the water with which it is washed remains clear, drain off all the water, then mix this milk with six whites of eggs; strain out the juice of the fifteenth part of a clove of garlick, and add it to the first two substances; pound the whole in a mortar, and add gradually sifted quick lime until a dry paste is formed, stir it until it is well mixed.

When this cement is wanted for use, a part of it is ground on a glass with a little water; when well ground, it is put upon the pieces to be mended, and placed in the shade to dry. This cement resists fire and boiling water, if it has been dried with proper care.

Valuable vases may be mended perfectly and very firmly, and the defects are concealed by painting the porcelain. The mixture of curdled milk, white of eggs, juice of garlick, may be left to dry; powdered afterwards, and mixed with an equal quantity of quick lime, and kept in well corked bottles. It is thus that this cement comes from England. [*Ibid.*

From the Philosophical Magazine and Journal of Science.

Account of a curious Chinese Mirror, which reflected from its polished face the figures embossed upon its back. By Sir D. Brewster, K. H. L. L. D. &c.

We have just received through the kindness of George Swinton, Esq. of Calcutta, whose zeal for the promotion of science is never relaxed, an account of a curious metallic mirror, which had been recently brought from China to Calcutta, and was then amusing the dilettanti, and perplexing the philosophers of our eastern metropolis.

This mirror has a circular form, and is about five inches in diameter. It has a knob in the centre of the back, by which it can be held, and on the rest of the back are stamped in relief certain circles with a kind of Grecian border. Its polished face has that degree of convexity which gives an image of the face half its natural size; and its remarkable property is, *that when you reflect the rays of the sun from the polished surface, the image of the ornamental border, and circles stamped upon the back is seen* (we presume in shadow) *distinctly reflected on the wall.*

The metal of which the mirror is made appears to be what is called Chinese silver, a composition of tin and copper, like the metal for the specula of reflecting telescopes. The metal is very sonorous.

The mirror has a rim of about one-fourth or one-sixth of an inch broad, and the inner part upon which the figures are stamped, is considerably thinner.

Mr. Swinton states, that no person he has met with has either seen or heard of any thing similar to this mirror. The gentleman who brought it from China, says that they are very uncommon in that country; and that this one, with a few others, was brought by a Dutch ship from Japan several years ago. On the back of one of these was a dragon, which was most distinctly reflected from the polished side. Mr. Swinton also mentions that he has another Chinese circular mirror, which is curiously embossed on the back. It is eight inches in diameter, but as its polish is rubbed of, he has not yet been able, by replacing it, to ascertain if it reflects a picture similar to the figure stamped upon its back. Mr. Swinton adds, that the original mirror first described, is to be sent to England, either to Sir John Herschel, or to the writer of this notice: and in the mean time he proposes to us the question, "how are these strange optical effects produced?"

Mr. Swinton himself ingeniously conjectures that the phenomena may have their origin in a difference of density in different parts of the metal, occasioned by the stamping of the figures on the back, the light being reflected more or less strongly from parts that have been more or less compressed. If metals were absolutely opaque, and if the light which they reflect had never entered their substance, as in the case of reflections from transparent bodies, then the only possible way by which they could give a picture of the figures stamped behind would be that which Mr. Swinton suggests.*

I believe, however, on the authority of the phenomena of elliptical polarization, that in silver nearly one-half of the reflected light has entered the metal, and in other metals a less portion; so that we may consider the surface of every metal as transparent to a certain depth—a fact which is proved also by the transparency of gold and silver leaf. Now this thin film having its parts of variable density, in consequence of the stamping of the figure, might re-produce the figure by reflection. It is well known that silver *polished by hammering*, acts differently upon light from silver that has received a *specular polish*, and I have elsewhere† expressed the opinion that a parabolic reflector of silvered copper, polished by hammering, will, from the difference of density of the reflecting film, produce at the distance of many miles, a perceptible scattering of the reflecting rays, similar to what takes place in a transparent fluid or solid, or gaseous medium. I am satisfied, however, that at the distance of a few inches from the Chinese mirror, this evanescent effect will be altogether imperceptible, and

*A series of pretty deceptions might be made on the same principle by painting (with thin transparent varnishes, laid on in narrow lines,) a figure on the back surface of a plate of glass. The figures would be seen by reflecting the light of the sun upon a wall, in consequence of the reflection being destroyed, or nearly so, at those parts of the back surface which are covered with the varnish, and of the light being scattered at the outer surface of the varnish. In ordinary lights the lines would not be visible, but they would distinctly appear in the reflected rays of the sun.

†Edinb. Trans. vol. xi. p. 47.

that we must seek for another cause of the phenomenon under consideration.

Some years ago I had occasion to observe the light of the sun reflected upon paper from a new and highly polished gilt button, and I made a drawing at the time of the figure which appeared in the spectrum. It consisted of radiations exactly like the spokes of a carriage wheel, the radiations being *sixteen* in number, and a little confused in the centre opposite the eye of the button. On the back of this button several words were deeply stamped, but these words did not appear in the reflected image. I have since examined several varieties of such buttons, and they almost all give either radiations or great numbers of narrow concentric rings, and sometimes both, whose centre is the centre of the button, and the smallest one of which is always like a dimple in the centre.

Upon examining the surface of these buttons in the sun's light and at the edge of a shadow,* I have invariably been able to see the same rings excavated in the polished face that appeared in the luminous image, which it reflected. They obviously arise from the button being finished in a turning lathe, and the rings are produced by the action of the burnisher, or probably, in some cases they may be the grooves of the turning tool, which have not been obliterated by the subsequent processes.†

These facts will, I presume, furnish us with the secret of the Chinese mirror. Like all other conjurers, the artist has contrived to make the observer deceive himself. The stamped figures on the back, are used for this purpose. The spectrum in the luminous area is *not an image of the figures on the back.* The figures are a copy of the picture which the artist has *drawn on the face of the mirror*, and so concealed by polishing that it is invisible in ordinary lights, and can be brought out only in the sun's rays.

Let it be required, for example, to produce the dragon described by Mr. Swinton as exhibited by one of the Chinese mirrors. When the surface of the mirror is ready for polishing, the figure of the dragon may be delineated upon it in extremely shallow lines, or it may be eaten out by an acid much diluted, so as to remove the smallest possible portion of the metal. The surface must then be highly polished, not upon pitch, like glass and specula, because this will polish away the figure, but upon cloth in the way that lenses are sometimes polished. In this way the sunk part of the shallow lines will be as highly polished as the rest, and the figure will only be visible in very strong lights, by reflecting the sun's rays from the metallic surface.

When the space occupied by the figure is covered by lines or by etching, the figure will appear *in shade* on the wall; but if this space is left untouched, and the part round it be covered by lines, or etching, the figure will appear most luminous.

* By this method the figure in the Chinese mirror could be rendered visible beneath its polish.

† In polished steel buttons the reflected light is crowded with lines running at right angles to each other, and clearly indicating the cross strokes by which they have been ground and polished.

We would recommend this subject to the notice of the optician; as to furnish him with a lucrative article of trade.
Allerly, Nov. 8, 1832.

¶ *Selections from Lectures on Pottery, delivered before the Royal Institution, London, by* A. Aikins, F. L. S. F. G. S.

Certain natural earthy mixtures, called clays, possess the property of plasticity; that is, when mixed with water so as to be sensibly moist, they yield readily in any direction to pressure without breaking, and when the pressure is removed, they retain the form given to them, without showing any tendency to return to their original figure. When dried, by the air or by the sunshine, or by an artificial heat not exceeding that of boiling water, they acquire a certain degree of hardness; but when pressed by a force greater than their power of resistance, they give way at once, having lost their plasticity, and having become perfectly brittle. These fragments, however, when beaten up with water, compose a mass equally ductile as at first. But if the dried clay has been subjected to a red heat, its hardness is found to be much increased; and its fragments, when broken, are no more capable of forming a mass with water than so much sand. On these two properties of clay, namely, its original plasticity, and its subsequent hardness and resistance to the action of water when burnt, the manufacture of earthenware essentially depends: the former allowing the artist easily to give to the material any figure that he pleases, and the latter giving to the ware the requisite firmness, and the capability of holding liquids, and resisting the action of most of them even when boiling hot.

Clay consists essentially of two ingredients, alumina and silica. The first of these it is which, by its combination with water, acquires that pulpy kind of consistence which fits it to be the cement of the mass; the silica is in the state of sand more or less fine, and may be considered as the passive ingredient. If pure alumina be beaten up with water and afterwards dried, however slowly, it will be found to contract greatly in all its dimensions, and in so doing will become rifty, that is, full of cracks, and will exfoliate and fall to pieces. The addition of sand, especially in the proportion of from five to ten parts of it to one of alumina, leaves the mass still plastic, and diminishes greatly the defects which would attend the use of alumina alone. A red heat, in proportion to its intensity, produces effects on alumina similar to those which evaporation does; the mass contracts, and if it is large or thick, the heat will necessarily be unequally applied; hence arises not only a diminution of bulk, but cracks and warping from the truth of the original figure. But sand, which obviates in a great degree the former defects, also corrects these, because it is neither liable to combine with water, nor undergo permanent contraction by heat. If, now, the natural clays consisted merely of silica and alumina, all their varieties would depend on the rela-

tive proportion of the two ingredients, and on the coarseness or fineness of the grains of sand. The higher the heat to which alumina is exposed, the harder and more compact it becomes, so that at length it will scratch glass, and will not admit water to rise in its pores; and as the mixture of alumina and silica in any proportions is infusible in the heat of our furnaces, it is evident that a great degree of hardness may be given, by high and continued firing, to wares made of these ingredients, and that such ware will resist the percolation of fluids; but, at the same time, in proportion to its density will be the hazard of warping during the process of being baked.

It is, however, extremely rare to find a clay which contains only the two substances above mentioned. In general they are mixed with lime in the state of carbonate and sulphate, with magnesia in the state of carbonate, with iron in the state of oxide, or combined with sulphur, and with common salt. Almost all these compounds, or at least the bases of them, when exposed to a red heat, act chemically on one another, and on the silica and alumina. The precise nature of these actions has not been ascertained, the matter not having yet been investigated with the care that its importance deserves, but the following particulars may perhaps be considered as sufficiently authenticated.

At a moderate red heat, the iron, if neither lime nor magnesia be present, gives to the mass a more or less red colour. If lime be present in sufficient quantity, the colour given by the iron is cream-brown, passing into buff colour. If magnesia be also present—for I am not acquainted with any clay that contains magnesia without lime—the colour of the ware is brownish yellow, or the colour of unburnt ochre.

The carbonate of lime loses its carbonic acid, which escapes in the form of gas through the pores of the ware, provided the carbonate be thoroughly mixed with the other ingredients; but whenever a lump of it, even no bigger than a pea, occurs, a hole, reaching to the surface, is generally produced, probably by the rapid escape of the gas. Another effect produced by the lime is, that it combines with the alumina; and if the former be equal in quantity to the latter, it greatly diminishes, and, according to Bergman, almost entirely prevents the contraction of the alumina. At a more intense heat, the lime, the sand, and the alumina, melt together into an imperfect glass or slag, which, as it is formed, dissolves the oxide of iron, and thus acquires a bluish black, or greenish blue colour. The common salt is also decomposed; and the soda, which is its base, assists the action of the lime. The magnesia, sometimes at least, combines with sulphuric acid, which it gets partly from the iron pyrites mixed with the clay, and partly from the fuel when coal is made use of. This sulphate of magnesia it is which is occasionally found to cover the outer surface of new-built walls with a saline efflorescence, like hoar frost.

Having now stated the general principles on which the manufacture of earthenware depends, I proceed to give some account of the principal varieties of it. These I shall arrange in groups, characterized for the most part by the greater or less elaborateness of the

process employed in the preparation of the ingredients, and the beauty, the fineness, and commercial value of the ware itself.

The coarsest and most simple kind of earthenware is that employed in the walls, and as the covering of houses and other buildings; of this there are two kinds, bricks and tiles.

Till lately bricks appear to have been made in this country in a very rude manner. The clay was dug in the autumn, and exposed to the winter frost to mellow; it was then mixed or not with coal ashes, and tempered by being trodden by horses or men, and was afterwards moulded, without it being considered necessary to take out the stones. The bricks were burnt in kilns or in clamps: the former was the original mode, the latter having been resorted to from motives of economy. When clamps began to be employed I do not know, but they are mentioned in an act of parliament passed in 1726, and therefore were in use prior to that date.

It is chiefly, I believe entirely, from the alluvial deposits above the London clay, that bricks are made in the vicinity of the metropolis; and a section of these deposits generally presents the following series, such as would naturally result from a mixture of stones, and sand, and clay, and chalk, brought together by a torrent of water, and then allowed to subside. The lower part of the bed is gravel, mixed more or less with coarse sandy clay and pieces of chalk; this by degrees passes into what is technically called malm, which is a mixture of sand, comminuted chalk, and clay; and this graduates into the upper earth or strong clay, in which the clay is the prevailing or characterizing ingredient, the proportion of chalk being so small that the earth makes no sensible effervescence with acids. Bricks made of the upper earth, without any addition, are apt to crack in drying, and in burning they are very liable to warp, as well as to contract considerably in all their dimensions: on this account they cannot be used for the exterior of walls, and a greater number of such are required for any given quantity of work than of bricks, which, though made in the same mould, shrink less in the baking. The texture, however, of such bricks is compact, which makes them strong and durable. Bricks formed of this clay, whether mixed or unmixed, are called stocks: it was formerly used unwashed, and when the bricks were intended to be kiln-burnt, or flame-burnt, to use the technical word, no addition was made to the clay. If they were intended to be clamp-burnt, coal ash was mixed during the tempering. Of these and all other clamp-burnt bricks the builders distinguish two kinds, namely, the well-burnt ones from the interior, and the half-burnt ones, or place bricks, from the outside of the kiln.

At present the clay for stock bricks is separated with tolerable care from the pebbles, and its tendency to shrink and warp is diminished by the addition of chalk ground to the consistency of cream; but the calcareous earth increases the liability of the brick to vitrify in the burning, to counteract which, more sand is added. By these successive additions, however, the compactness of the texture is diminished, and such stock bricks approach nearly to the quality of

malm bricks. Sometimes, instead of chalk and sand, malm earth and ashes are added.

The calcareous clay, or malm earth, requires no addition of sand or chalk, but only of ashes. The bricks made of it differ from those made of the top earth, in being of a pale or liver brown colour, mixed more or less with yellow, which is an indication of magnesia; and such bricks are liable to effloresce. The hardest of the malm bricks are of a pale brown colour, and are known by the name of gray stocks; those next in hardness are called seconds, and are employed for fronts of the better kind of houses; the yellowest and softest are called cutters, from the facility with which they can be cut or rubbed down, and are used chiefly for turning the arches of windows. What I have said of top earth and malm earth must be understood, however, to refer to well characterized samples of these varieties, but, as might be expected, there are several brick fields that yield a material partaking more or less of the qualities of both, and therefore requiring corresponding modifications in its manufacture.

Brick earth is usually begun to be dug in September, that it may have the benefit of the frost in mellowing it and breaking it down. It is then washed by grinding with water, and passed through a grating in order to separate the stones; the mud runs into shallow pits, and here is to be mixed with ground chalk, if any is required: when it has become tolerably stiff by drying, coal ash is added, usually in the proportion of one foot in depth of this latter, to three feet of clay; the ingredients are then to be well mixed, and, finally, the composition is to pass through the pug-mill, in order to complete the mixture and to temper it. The moulder stands at a table, and the tempered clay is brought to him in lumps of about seven or eight pounds; the mould is a box without top or bottom, nine and five-eighths inches long, four and three-fourths wide, and two and three-fourths deep; it lies on a table; a little sand is first sprinkled in, and then the lump of clay forcibly dashed into the mould, the workman at the same time rapidly working it by his fingers so as to make it completely close up to the corners; next he scrapes off with a wetted stick the superfluous clay, shakes the brick dexterously out of the mould on to a flat piece of board, on which it is carried to a place called the hacks; here it remains till dry enough to handle, and is then formed into open hollow walls, which are covered with straw to keep off the rain, where it dries gradually, and hardens till it is fit to be burnt. A raw brick weighs between six and seven pounds; when ready for the clamp it has lost about one pound of water by evaporation.* A first rate moulder has been known to deliver from 10,000 to 11,000 bricks in

* From some experiments made in France we learn the following particulars: A mould eight inches three lines long, four inches three lines broad, and two inches two lines thick, yielded bricks which on an average weighed, when first made, five pounds fourteen ounces. When dried and ready for the kiln they weighed four pounds eight ounces, having lost twenty-two ounces of water: nine ounces of this quantity evaporates in the first twenty-four hours, the other thirteen ounces require five or six weeks to evaporate. By burning, four ounces more of volatile matter is driven off; a well-burnt brick of the above dimensions

the course of a long summer's day, but the average produce is not more than half this number. If, however, the average daily produce of one moulder be estimated only at 5000 bricks, it is quite evident that the project of moulding them by expensive machinery, complicated, and therefore liable to want frequent repairs, cannot but be a most ruinous speculation.

The consumption of London is chiefly from the brick fields north of the Thames, at Stepney, Hackney, Tottenham, Kingsland, Hammersmith, Cowley, Acton, and Brentford. Those made at Grays Thurrock, Purfleet, and Sittingbourne, are of a very good quality, and a fine yellow colour; stone coloured ones are made near Ipswich, and have been largely employed in the outside walls of some of the new churches of the metropolis. There is a considerable exportation of bricks from London, many being sent to the West Indies, to Quebec, and to other colonies.

[TO BE CONTINUED.]

¶ *On the timber used for the Masts of Ships.*

Communicated to the Nautical Magazine by JOHN FINCHAM, Esq., Superintendent of the School of Naval Architecture in his Majesty's Dock Yard at Portsmouth.

The timber commonly used for masts is fir and pine, which are distinguished according to the character of their leaves and cones. Duhamel says, "that the leaves of the pines are slender and filaceous, more or less long, according to the species; two, three, or more, of these thin leaves proceeding from the same bud. It is this characteristic which distinguishes them from the fir, whose leaves are straight and separate, and all proceeding from one slight stem, similar to the teeth of a comb."

The timber used for masts is distinguished by mast makers by the name of the place from which it is imported; as the Norway and Riga firs, Canada red and white pines, &c.

The timber that possesses in the greatest degree the qualities best suited for masting is *pinus silvestris Genevensis vulgaris*, from the north of Europe, from the vast forests of Russia, Norway, and Po-

weighing four pounds four ounces. A fresh burnt brick when laid in water, absorbs about nine ounces; i. e. from one-seventh to one-eighth of its weight.

It appears, however, from experiments by M. Gallon, that the weight of bricks varies according to the care with which the clay is worked or tempered. Some clay was well worked, and then beaten for half an hour, on the morning of the next day it was again worked and beaten as before, and in the afternoon was again beaten for a quarter of an hour, and was then made into bricks. Another parcel of bricks was made of some of the same clay, treated in the usual manner. Both parcels were dried in the air for thirteen days, when it was found that those made by the former process weighed on an average five pounds eleven ounces each, while those made by the latter weighed five pounds seven ounces. Both kinds were burnt together for ten days, they underwent no relative change in bulk, but the weight of the former was five pounds six ounces, and of the latter five pounds two ounces.—*Arts et Métiers*, vol. iv.

land: that which is most esteemed is obtained from the forests of the Ukraine and Livonia; it is brought down the Dwina, and is commonly called Riga, on account of its being shipped from that port. In the same way, the Adriatic fir derives its name from being shipped in the Adriatic.

The great expense of Riga timber, and the difficulty there frequently is of obtaining it in time of war, have been inducements to Great Britain, as well as to other nations, to endeavour to have resources for masting their navy within their own states and colonies.

The different firs and pines, besides those of the north, used for masting the royal navy of Great Britain, and likewise to a great extent her commercial navy, are principally those from Canada, with some from Nova Scotia, and a few from Scotland. The timber from Canada consists chiefly of the white or yellow pine, *pinus strobus*, commonly called the Weymouth, or white masting pine; and the white, red, and black spruce, *pinus Canadensis*. The Scotch fir, *pinus silvestris*, is common to the Highlands of Scotland, as well as to Norway, Denmark, and Sweden.

The standing masts are generally made of the yellow, and topmast of the red pine; the white, red, and black spruce are but little used, except for small spars. Although the red and yellow pines do not possess, in an eminent degree, those good qualities which are found in those of the north, yet they have them to such an extent, especially the red pine, as qualifies them for the purposes for which they are employed. The Adriatic fir is frequently used for the masts of cutters and other small vessels, but does not possess particularly good qualities.

The woods that have been partially used for masts, are the Poon from the East Indies, and the cowrie. The poon has been used for masting ships built in India; the cowrie is brought from New Zealand, and has been used for small standing masts, and for topmasts as high as those of frigates, and even for a first rate. It possesses many of the most esteemed qualities for masting, and will probably be found to be a wood very eligible for this purpose. The cowrie resembles the pine in being coniferous, and containing a considerable quantity of resin, which exudes from it spontaneously.

The French, according to Forfait, M. le Ray, De Castries, and others, have recieved considerable supplies from Corsica, from the Pyrenees, and some from the Alps. To obtain supplies from the Pyrenees, they took immense pains to cut roads from the forests to the plains. They appear, likewise, to have received supplies from Catalonia, Savoy, from the departments of Mont Blanc, Puy de Dome, and Cantal. These firs, however, contain but little resinous substance; the heart is porous, the grain coarse; their flexibility is very trifling; and from a quick evaporation of their substances, they soon become dry, so that they break under very slight strains.

The pines from the Pyrenees are also inferior to those of the north. having but a small quantity of resinous substance in them, which soon evaporates; and from the difference of the soil, they are very variable in quality; many, however, are of a fine grain, and of considerable strength and elasticity, until they become dry. Those from Corsica,

pinus halepensis, of which species many grow on the Mediterranean side of France, Spain, Italy, Asia Minor, and Barbary, and likewise some on the south-east of France, have more resin in them, and are harder and considerably better than those from the Pyrenees.

The Turks obtain excellent firs from the shores of the Black Sea, from the Bosphorus to Sinope; they are commonly of the species denominated *pinus pinea* and *pinus laricis:* they are of better quality than is common to these species, and are little inferior to those of the north. These trees are plentiful near the Olympus, and in the interior of Asia Minor: the stem is straight, and grows to a considerable height and size. The Turks use them not only in masting, but likewise in the construction of the hull.

In selecting firs for masting, the climate, aspect, and soil in which they grow are to be considered. The state of the tree, when standing, may be known, in a great measure, from the luxuriance of its upper branches: if they be dead, or do not appear flourishing, the tree may likewise be considered on the decay.

To judge of the qualities of trees while standing, belongs more immediately to those employed in the forests; while the mast maker is left only to make his choice of the trees when felled, and whose attention is only drawn to their appearance as timber.

To become familiar with the different kinds and qualities of fir timber, requires considerable practice, and close observation, with likewise a proper acquaintance with some of the general appearances that distinguish these qualities. The firs most desirable are those with a fine and close grain, where the ligneous layers are closely blended together, and with the annual and concentric circles fine and firmly connected, and decreasing gradually from the heart to the sap. The nearer the concentric layers are to circles or ellipses, the less likely is the timber to be defective, as sudden swells are frequently caused by rindgalls. They are also generally strongly charged with resin, which is not only beneficial in giving strength and elasticity, but preserves the timber from insects, and prevents fermentation and decay. The colour should be of a clear or bright yel low, with a reddish cast alternately. The smell in the Riga, and other firs of this quality, should be strongly resinous, especially when they are exposed to the sun, or any other heat, or when their shavings are rubbed between the fingers. On the contrary, when the layers are separate, porous, or open, with tints of a pale red near the heart, and white spots intermixed, or of a dark red, with the resinous particles of a blackish colour, the timber is in a state of decay. Likewise, when the firs are cut transversely, and are of a colour not uniform, but interspersed with veins, and the smell is either entirely gone, or become fetid, they may be considered past their prime, and approaching to a state of decay. In yellow and red pines that have not the strong resinous smell, the degree of unsoundness is denoted by the offensiveness of the smell; and they will, in common with other firs, have alternate layers of a foxy brown or red colour, and will break out before the sharpest plane in being wrought.

[TO BE CONTINUED.]

¶ Popular Science.

No. I.

Selections from Letters on Natural Magic.

By Sir David Brewster.*

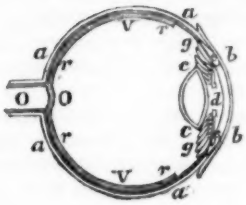
Illusions, &c. of the Eye.

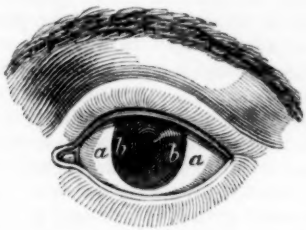
Of all the organs by which we acquire a knowledge of external nature, the eye is the most remarkable and the most important. By our other senses the information we obtain is comparatively limited. The touch and the taste extend no further than the surface of our own bodies. The sense of smell is exercised within a very narrow sphere, and that of recognising sounds is limited to the distance at which we hear the bursting of a meteor, and the crash of a thunderbolt. But the eye enjoys a boundless range of observation. It takes cognizance, not only of other worlds belonging to the solar system, but of other systems of worlds infinitely removed into the immensity of space; and when aided by the telescope, the invention of human wisdom, it is able to discover the forms, the phenomena, and the movements of bodies whose distance is as inexpressible in language as it is inconceivable in thought.

While the human eye has been admired by ordinary observers for the beauty of its form, the power of its movements, and the variety of its expression, it has excited the wonder of philosophers by the exquisite mechanism of its interior, and its singular adaptation to the variety of purposes which it has to serve. The eyeball is nearly globular, and is about an inch in diameter. It is formed externally by a tough opaque membrane called the *sclerotic* coat, which forms the white of the eye, with the exception of a small circular portion in front called the *cornea*. This portion is perfectly transparent, and so tough in its nature as to afford a powerful resistance to external injury. Immediately within the cornea, and in contact with it, is the aqueous humour, a clear fluid, which occupies only a small part of front of the eye. Within this humour is the *iris*, a circular membrane with a hole in its centre, called the pupil. The colour of the eye resides in this membrane, which has the curious property of contracting and expanding so as to diminish or enlarge the pupil,—an effect which human ingenuity has not been able even to imitate. Behind the iris is suspended the *crystalline* lens in a fine transparent capsule, or bag, of the same form with itself. It is then succeeded by the *vitreous humour*, which resembles the transparent white of an egg, and fills up the rest of the eye. Behind the vitreous humour, there is spread out on the inside of the eyeball a fine delicate membrane, called the *retina*, which is an expansion of the *optic nerve*, entering the back of the eye, and communicating with the brain.

A front view and section through the axis of the eye, shown in the annexed figure, will convey a popular idea of its structure. It is, as it were, a small camera obscura, by means of which the pictures of external objects are painted on the retina, and, in a way of which we are ignorant, it conveys the impression of them to the brain.

* American edition, published by J. & J. Harper, New York.





This wonderful organ may be considered as the sentinel which guards the pass between the worlds of matter and of spirit, and through which all their communications are interchanged. The optic nerve is the channel by which the mind pursues the handwriting of nature on the retina, and through which it transfers to that material tablet its decisions and its creations. The eye is consequently the principal seat of the supernatural. When the indications of the marvellous are addressed to us through the ear, the mind may be startled without being deceived, and reason may succeed in suggesting some probable source of the illusion by which we have been alarmed: but when the eye in solitude sees before it the forms of life, fresh in their colours and vivid in their outline; when distant or departed friends are suddenly presented to its view; when visible bodies disappear and reappear without any intelligible cause; and when it beholds objects, whether real or imaginary, for whose presence no cause can be assigned, the conviction of supernatural agency becomes under ordinary circumstances unavoidable.

Hence it is not only an amusing but a useful occupation to acquire a knowledge of those causes which are capable of producing so strange a belief, whether it arises from the delusions which the mind practices upon itself, or from the dexterity and science of others. I shall therefore proceed to explain those illusions which have their origin in the eye, whether they are general, or only occasionally exhibited in particular persons, and under particular circumstances.

There are few persons aware that when they look with one eye, there is some particular object before them to which they are absolutely blind. If we look with the right eye this point is always about fifteen degrees to the right of the object which we are viewing, or to the right of the axis of the eye or the point of most distinct vision. If we look with the left eye the point is as far to the left. In order to be convinced of this curious fact, which was discovered by M. Mariotte, place two coloured wafers upon a sheet of white paper at the distance of three inches, and look at the left hand wafer with the right eye at the distance of about eleven or twelve inches, taking care to keep the eye straight above the wafer, and the line which joins the eyes parallel to the line which joins the wafers. When this is done, and the left eye closed, the right hand wafer will no longer be visible. The same effect will be produced if we close the right eye and look with the left eye at the right hand wafer. When we examine the retina to discover to what part of it this insensibility to light be-

longs, we find that the image of the invisible wafer has fallen on the base of the optic nerve, or the place where this nerve enters the eye, and expands itself to form the retina. This point is shown in the preceding figure by a convexity at the place where the nerve enters the eye.

But though light of ordinary intensity makes no impression upon this part of the eye, a very strong light does, and even when we use candles, or highly luminous bodies, in place of wafers, the body does not wholly disappear, but leaves behind a faint cloudy light, without, however, giving any thing like an image of the object from which the light proceeds.

When the objects are white wafers upon a black ground, the white wafer absolutely disappears, and the space which it covers appears to be completely black; and as the light which illuminates a landscape is not much different from that of a white wafer, we should expect, whether we use one or both eyes,* to see a black or a dark spot upon every landscape within fifteen degrees of the point which most particularly attracts our notice. The Divine Artificer, however, has not left his work thus imperfect. Though the base of the optic nerve is insensible to light that falls directly upon it, yet it has been made susceptible of receiving luminous impressions from the parts which surround it, and the consequence of this is, that when the wafer disappears, the spot which it occupied, in place of being black, has always the same colour as the ground upon which the wafer is laid, being white when the wafer is placed upon a white ground, and red when it is placed upon a red ground. This curious effect may be rudely illustrated by comparing the retina to a sheet of blotting paper, and the base of the optic nerve to a circular portion of it covered with a piece of sponge. If a shower falls upon the paper, the protected part will not be wetted by the rain which falls upon the sponge that covers it, but in a few seconds it will be as effectually wetted by the moisture which it absorbs from the wet paper with which it is surrounded. In like manner the insensible spot on the retina is stimulated by a borrowed light, and the apparent defect is so completely removed that its existence can be determined only by the experiment already described.

Of the same character, but far more general in its effects, and important in its consequences, is another illusion of the eye which presented itself to me several years ago. When the eye is steadily occupied in viewing any particular object, or when it takes a fixed direction while the mind is occupied with any engrossing topic of speculation or of grief, it suddenly loses sight of, or becomes blind to, objects seen indirectly, or upon which it is not fully directed. This takes place whether we use one or both eyes, and the object which disappears will reappear without any change in the position of the eye, while other objects will vanish and revive in succession without any apparent cause. If a sportsman, for example, is watching with intense interest the motions of one of his dogs, his companion, though

* When both eyes are open, the object whose image falls upon the insensible spot of the one eye is seen by the other, so that though it is not invisible, yet it will only be half as luminous, and therefore two dark spots ought to be seen.

seen with perfect clearness by indirect vision, will vanish, and the light of the heath, or of the sky, will close in upon the spot which he occupied.

In order to witness this illusion, put a little bit of white paper on a green cloth, and within three or four inches of it place a narrow strip of white paper. At the distance of twelve or eighteen inches, fix one eye steadily upon the little bit of white paper, and in a short time a part or even the whole of the strip of paper will vanish as if it had been removed from the green cloth. It will again reappear, and again vanish, the effect depending greatly on the steadiness with which the eye is kept fixed. This illusion takes place when both the eyes are open, though it is easier to observe it when one of them is closed. The same thing happens when the object is luminous. When a candle is thus seen by indirect vision, it never wholly disappears, but it spreads itself out into a cloudy mass, the centre of which is blue, encircled with a bright ring of yellow light.

The inability of the eye to preserve a sustained vision of objects seen obliquely, is curiously compensated by the greater sensibility of those parts of the eye that have this defect. The eye has the power of seeing objects with perfect distinctness, only when it is directed straight upon them; that is, all objects seen indirectly are seen indistinctly: but it is a curious circumstance, that when we wish to obtain a sight of a very faint star, such as one of the satellites of Saturn, we can see it most distinctly *by looking away from it*, and when the eye is turned full upon it, it immediately disappears.

Effects still more remarkable are produced in the eye when it views objects that are difficult to be seen from the small degree of light with which they happen to be illuminated. The imperfect view which we obtain of such objects forces us to fix the eye more steadily upon them; but the more exertion we make to ascertain what they are, the greater difficulties do we encounter to accomplish our object. The eye is actually thrown into a state of the most painful agitation; the object will swell and contract, and partly disappear, and it will again become visible when the eye has recovered from the delirium into which it has been thrown. This phenomena may be most distinctly seen when the objects in a room are illuminated with the feeble gleam of a fire almost extinguished; but it may be observed in daylight by the sportsman when he endeavours to mark upon the monotonous heath the particular spot where moor game has alighted. Availing himself of the slightest differencc of tint in the adjacent heath, he keeps his eye steadily fixed on it as he advances, but whenever the contrast of illumination is feeble, he will invariably lose sight of his mark, and if the retina is capable of taking it up, it is only to lose it a second time.

This illusion is likely to be most efficacious in the dark, when there is just sufficient light to render white objects faintly visible, and to persons who are either timid or credulous must prove a frequent source of alarm. Its influence too is greatly aided by another condition of the eye, into which it is thrown during partial darkness. The pupil expands nearly to the whole width of the iris in order to collect the feeble light which prevails; but it is demonstrable that in this state

the eye cannot accommodate itself to see near objects distinctly, so that the form of persons and things actually become more shadowy and confused when they come within the very distance at which we count upon obtaining the best view of them. These affections of the eye are, we are persuaded, very frequent causes of a particular class of apparitions which are seen at night by the young and ignorant. The spectres which are conjured up are always *white*, because no other colour can be seen, and they are either formed out of inanimate objects which reflect more light than others around them, or of animals or human beings whose colour, or change of place renders them more visible in the dark. When the eye dimly descries an inanimate object whose different parts reflect different degrees of light, its brighter parts may enable the spectator to keep up a continued view of it; but the disappearance and reappearance of its fainter parts, and the change of shape which ensues, will necessarily give it the semblance of a living form, and if it occupies a position which is unapproachable, and where animate objects cannot find their way, the mind will soon transfer to it a supernatural existence. In like manner a human figure shadowed forth in a feeble twilight may undergo similar changes, and after being distinctly seen while it is in a situation favourable for receiving and reflecting light, it may suddenly disappear in a position fully before, and within the reach of, the observer's eye; and if this evanescence takes place in a path or road where there was no sideway by which the figure could escape, it is not easy for an ordinary mind to efface the impression which it cannot fail to receive. Under such circumstances, we never think of distrusting an organ which we have never found to deceive us; and the truth of the maxim that "seeing is believing," is too universally admitted, and too deeply rooted in our nature, to admit, on any occasion, of a single exception.

In these observations we have supposed that the spectator bears along with him no fears or prejudices, and is a faithful interpreter of the phenomena presented to his senses; but if he is himself a believer in apparitions, and unwilling to receive an ocular demonstration of their reality, it is not difficult to conceive the picture which will be drawn when external objects are distorted and caricatured by the imperfect indications of his senses, and coloured with all the vivid hues of the imagination.

Accidental Colours.

In order to complete the history of the illusions which originate in the eye, it will be necessary to give some account of the phenomena called *ocular spectra* or *accidental colours*. If we cut a figure out of red paper, and placing it on a sheet of white paper, view it steadily for some seconds with one or both eyes fixed on a particular part of it, we shall observe the red colour to become less brilliant. If we then turn the eye from the red figure upon the white paper, we shall see a distinct *green* figure, which is the *spectrum*, or accidental colour of the red figure. With differently coloured figures we shall observe differently coloured spectra, as in the following table:—

Colour of the original figures.	Colour of the spectral figures.
Red.	Bluish green.
Orange,	Blue.
Yellow,	Indigo.
Green,	Reddish violet.
Blue,	Orange red.
Indigo,	Orange yellow.
Violet,	Yellow.
White,	Black.
Black,	White.

The last two of these experiments, viz. white and black figures, may be satisfactorily made by using a white medallion on a dark ground, and a black profile figure. The spectrum of the former will be found to be black, and that of the latter white.

These ocular spectra often show themselves without any effort on our part, and even without our knowledge. In a highly painted room illuminated by the sun, those parts of the furniture on which the sun does not directly fall, have always the opposite or accidental colour. If the sun shines through a chink in a *red* window curtain, its light will appear *green*, varying, as in the above table, with the colour of the curtain; and if we look at the image of a candle reflected from the water in a *blue* finger glass, it will appear *yellow*. Whenever, in short, the eye is affected with one prevailing colour, it sees at the same time the spectral or accidental colour, just as when a musical string is vibrating, the ear hears at the same time its fundamental and its harmonic sounds.

If the prevailing light is *white*, and *very strong*, the spectra which it produces are no longer black, but of various colours in succession. If we look at the sun, for example, when near the horizon, or when reflected from glass or water, so as to moderate its brilliancy, and keep the eye upon it steadily for a few seconds, we shall see, even for hours afterward, and whether the eye is open or shut, a spectre of the sun varying in its colours. At first, with the eye open, it is *brownish red* with a *sky-blue* border, and when the eye is shut, it is *green* with a *red* border. The *red* becomes more brilliant, and the *blue* more vivid, till the impression is gradually worn off; but even when they become very faint, they may be revived by a gentle pressure on the eyeball.

Duration of Impressions on the Retina.

It was found by a French philospoher, M. D'Arcet, that the impression of light continued on the retina about the eighth part of a second after the luminous body was withdrawn, and upon this principle Dr. Paris has constructed the pretty little instrument called *Thaumatrope*, or the *Wonder-turner*. It consists of a number of circular pieces of card, about two or three inches broad, which may be twirled round with great velocity by the application of the fore finger and thumb of each hand to pieces of silk string attached to opposite points of their circumference. On each side of the circular piece of card is painted part of a picture, or a part of a figure, in such a manner that

the two parts would form a group or a whole figure if we could see both sides at once. Harlequin, for example, is painted on one side, and Columbine on the other, so that by twirling round the card the two are seen at the same time in their usual mode of combination. The body of a Turk is drawn on one side, and his head on the reverse, and by the rotation of the card his head is replaced on his shoulders. The principle of this illusion may be extended to many other contrivances. Part of a sentence may be written on one side of a card and the rest on the reverse. Particular letters may be given on one side, and others upon the other, or even halves or parts of each letter may be put upon each side, or all these contrivances may be combined so that the sentiment which they express can be understood only when all the scattered parts are united by the revolution of the card.

Meteorological Observations for December, 1832.

Moon. Days		Therm. Sun-rise.	Therm. 2 P.M.	Barometer. Sun rise.	Barometer. 2 P.M.	Dew point	Wind. Direction.	Wind. Force.	Water fallen in rain.	State of the weather, and Remarks.
				Inches.	Inches.				Inches.	
	1	54°	44°	29.50	29.55	39°	S. W.	Blustering.	.2	Rain—flying clouds.
	2	32	32	30.05	30.05	18	NW. SE.	Calm.		Clear—cl'dy—light snow.
	3	32	34	29.70	29.60	34	N.E.	do.		Cloudy—rain.
	4	39	41	.60	.60	36	W. NE.	do.	.50	Clear—cloudy.
	5	31	38	30.15	30.20	29	W. N.	do.		Clear—cloudy.
	6	32	49	.35	.30	30	S. S. W.	do.		Hazy—Light clouds.
	7	32	46	.30	.30	32	S. S. W.	Moderate.		
	8	40	45	.04	29.90	40	SSE. S.	Calm.	.14	
	9	46	42	29.30	.30	36	S. SW.	do.	1.60	Light cl'ds: hazy: rain in night.
	10	32	40	.85	30.00	32	W.	Blustering.	.15	Foggy—rain.
	11	30	42	30.00	.90	32	W.	Moderate.		Fog—rain.
	12	41	43	29.45	.90	40	S. SSE.	do.	.40	Clear day.
	13	38	46	.45	.55	38	SW. W.	do.		Hazy—cloudy—r'n in n't
	14	40	46	.90	.55	37	SSE. S.	do.		Cloudy day.
	15	42	40	.64	.90	42	S.	do.		Cloudy day.
	16	35	43	.80	.64	38	NE.	do.	.92	Rainy day.
	17	41	44	.45	.80	38	W. S.	do.		Cloudy day.
	18	37	41	.15	.30	38	W.	Blustering.	.83	Rainy day.
	19	31	32	.30	.15	37	SE.	do.		Cloudy—flying clouds.
	20	30	36	.50	.33	15	W.	do.		Flying clouds—do.
	21	15	24	.60	.55	8	W.	do.		Clear day.
	22	19	24	.80	.60	6	W.	Moderate.		Clear day.
	23	13	25	30.00	.80	6	W.	do.		Light clouds—do.
	24	17	34	30.05	30.05	8	W.	do.		Clear day.
	25	31	40	.05	.10	17	S.	Calm.		Clear—light clouds.
	26	30	33	29.95	.00	26	SW.	do.		Cloudy—light clouds.
	27	35	42	30.10	.10	26	SW.	do.		Drizzle—rain.
	28	32	38	29.70	29.65	20	SE.	do.	.84	Heavy fog—clear.
	29	32	36	.80	30.00	24	S. W.	Moderate.		Clear day.
	30	28	33	.95	.00	19	W.	Blustering.		Cloudy—clear.
	31	28	43	30.30	.30	21	N.E. S.	Calm.		Clear day.
				.40	.30	22	S. SW.	do.		Light clouds—clear.
Mean		31.39	38.06	29.84	29.81	38.9			5.40	

	Thermometer.	Barometer.
Maximum height during the month,	54. on 1st.	30.50 on 30th.
Minimum do.	13. on 23d.	29.15 on 18th.
Mean do.	34.72	29.82